FIG. 1(a)

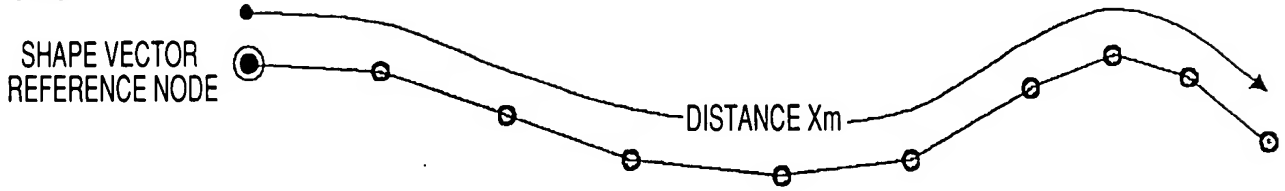


FIG. 1(b) QUANTIZATION OF SAMPLING POINTS IN THE DIRECTION OF DISTANCE

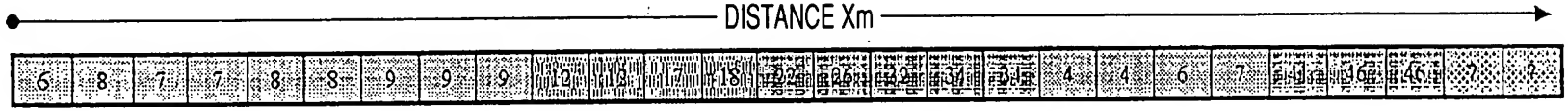


FIG. 1(c) QUANTIZATION OF TRAFFIC INFORMATION (SPEED)

FIG. 1(d) DIFFERENCE REPRESENTATION OF STATISTICAL PREDICTION VALUE

FIG. 2

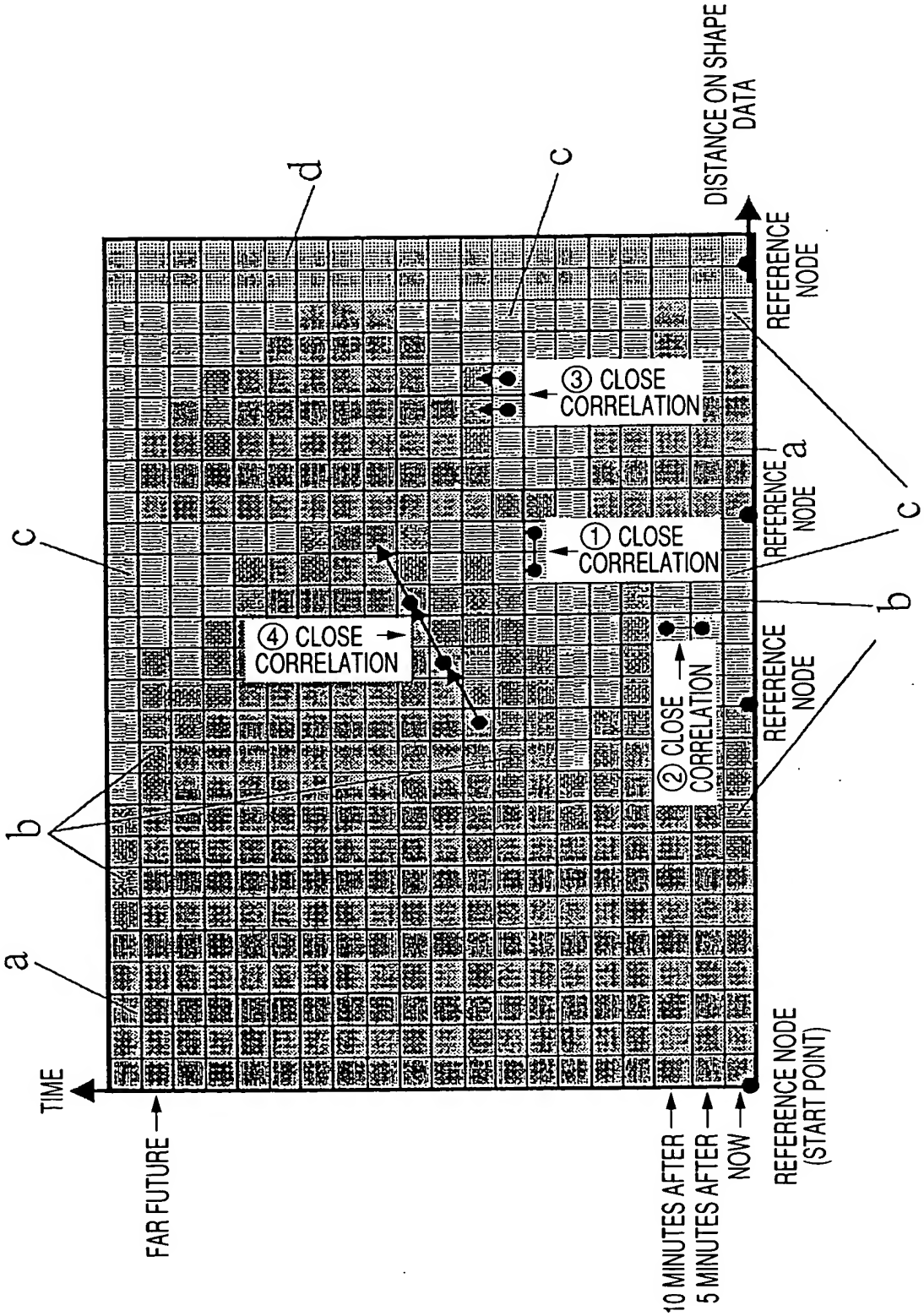

DISTANCE ON SHAPE DATA
REFERENCE NODE
REFERENCE NODE
REFERENCE NODE
REFERENCE NODE (START POINT)
③ CLOSE CORRELATION
① CLOSE CORRELATION
② CLOSE CORRELATION
④ CLOSE CORRELATION
a
b
c
d
TIME
FAR FUTURE
10 MINUTES AFTER
5 MINUTES AFTER
NOW

FIG. 3

TRAFFIC INFORMATION QUANTIZATION TABLE (SPEED QUANTIZATION TABLE)

QUANTIZED VOLUME	SPEED (km/h)
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10~11
11	12~13
12	14~15
13	16~17
14	18~19
15	20~24
16	25~29
17	30~34
18	35~39
19	40~44
20	45~49
21	50~59
22	60~69
23	70~79
24	80~99
≀	
30	200 OR MORE

FIG. 4

EXAMPLE OF ENCODING TABLE OF STATISTICAL PREDICTION DIFFERENCE VALUE OF TRAFFIC INFORMATION

SPECIAL CODE		CODE	ADDITIONAL BIT	
SECTION LENGTH CHANGE CODE		101	3 (40/80/160/···/5120m)	
TRAFFIC INFORMATION QUANTIZATION TABLE CHANGE CODE		111110	4 (TABLE NUMBER)	
IDENTIFICATION CODE FOR A POINT CORRESPONDING TO REFERENCE NODE		1100	6 (CORRESPONDING REFERENCE NODE NUMBER) + 8 (OFFSET DISTANCE FROM REFERENCE NODE)	
ENCODING TABLE FOR STATISTICAL PREDICTION DIFFERENCE VALUES OF TRAFFIC INFORMATION		CODE	ADDITIONAL BIT I	ADDITIONAL BIT II (RANGE)
RUN LENGTH	CHANGE VOLUME			
0	0	0	0	–
5	0	100	0	–
10	0	1101	0	–
0	±1	1110	1 (±IDENTIFICATION)	0
0	±2	111100	1 (±IDENTIFICATION)	0
0	±4	111101	1 (±IDENTIFICATION)	1 (3 OR 4)
≀				

FIG. 5

EXAMPLE OF APPARATUS CONFIGURATION
(APPLICATION TO CAR NAVIGATION SYSTEM)

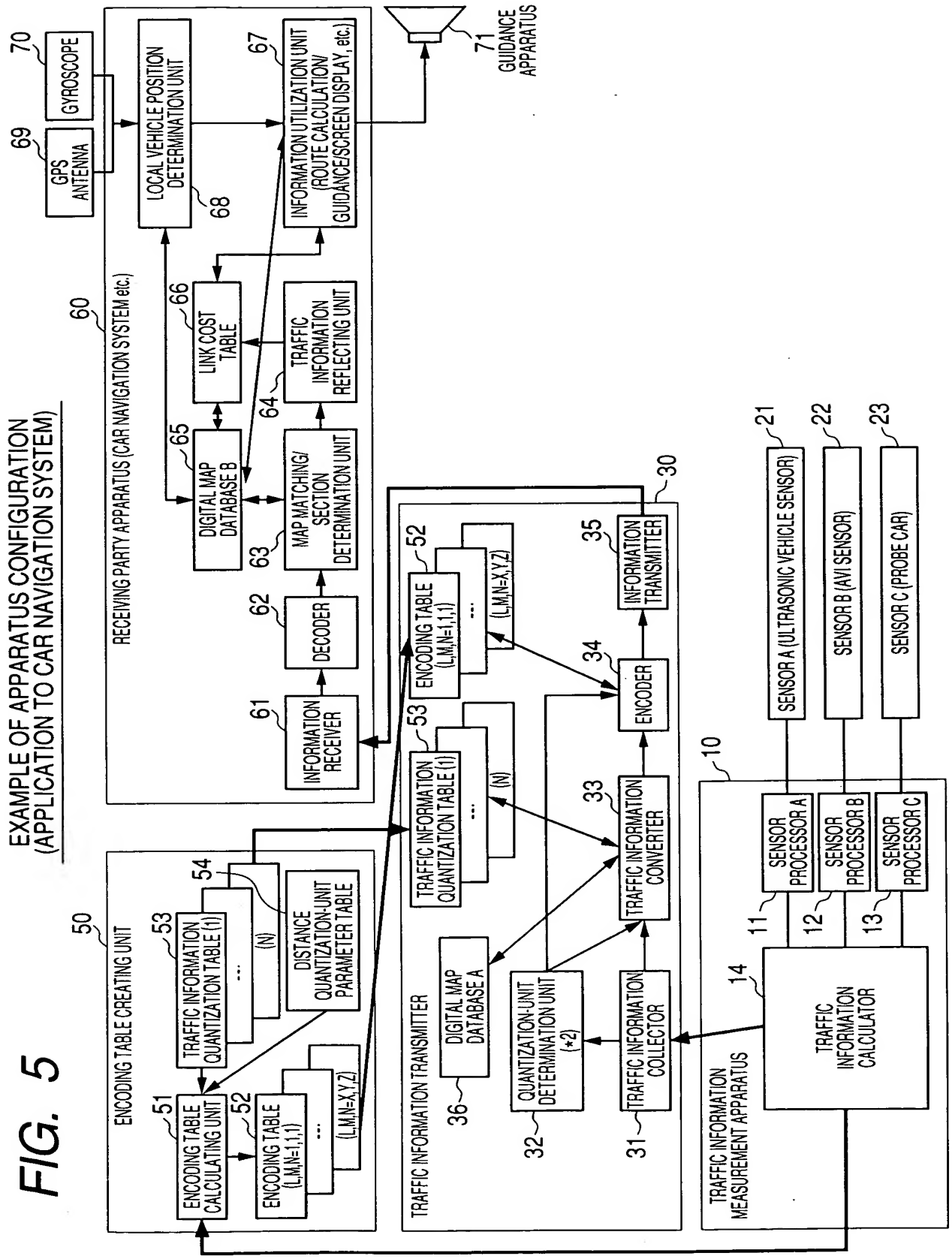


FIG. 6

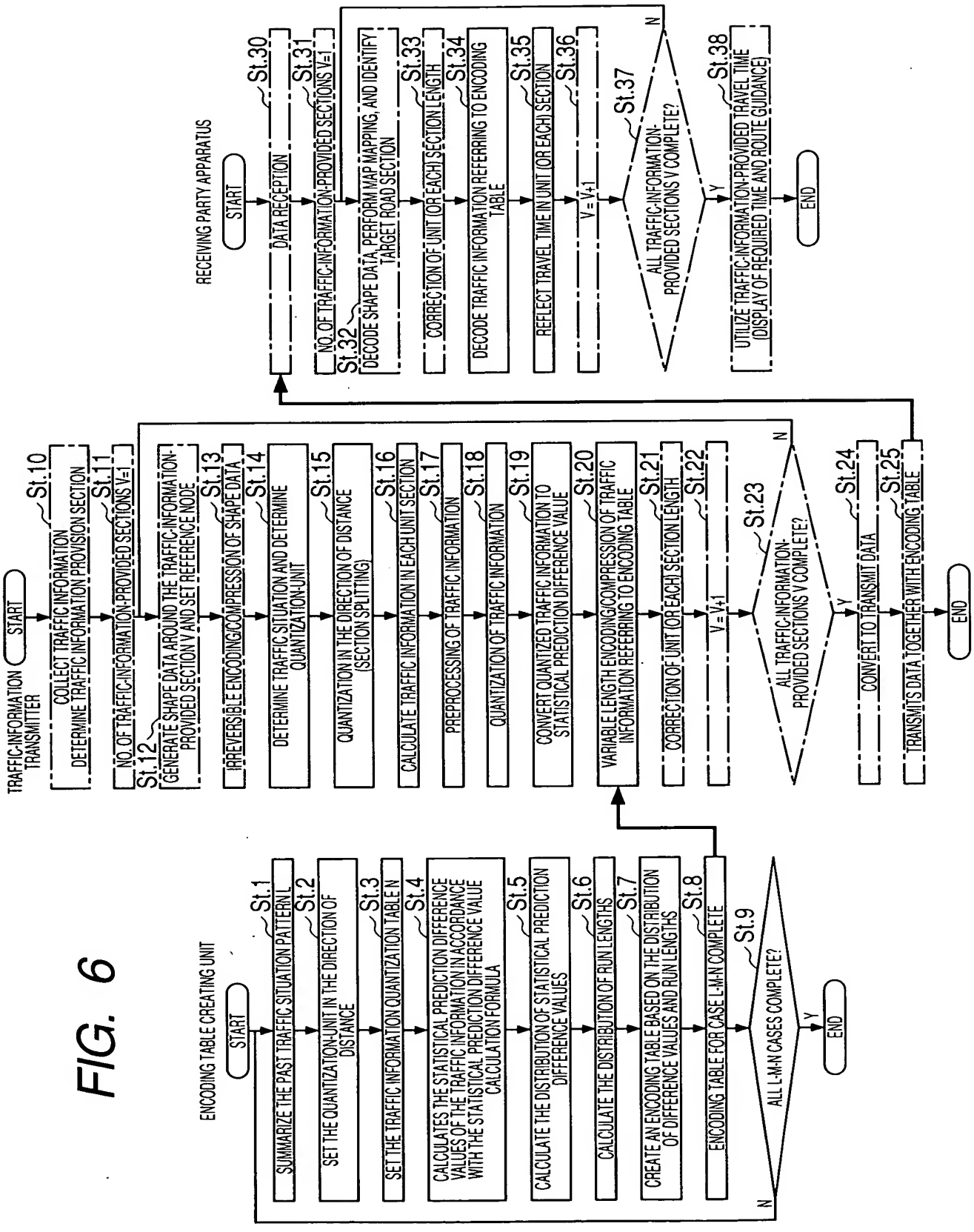

ENCODING TABLE CREATING UNIT
START
St.1 SUMMARIZE THE PAST TRAFFIC SITUATION PATTERN L
St.2 SET THE QUANTIZATION-UNIT IN THE DIRECTION OF DISTANCE
St.3 SET THE TRAFFIC INFORMATION QUANTIZATION TABLE N
St.4 CALCULATES THE STATISTICAL PREDICTION DIFFERENCE VALUES OF THE TRAFFIC INFORMATION IN ACCORDANCE WITH THE STATISTICAL PREDICTION DIFFERENCE VALUE CALCULATION FORMULA
St.5 CALCULATE THE DISTRIBUTION OF STATISTICAL PREDICTION DIFFERENCE VALUES
St.6 CALCULATE THE DISTRIBUTION OF RUN LENGTHS
St.7 CREATE AN ENCODING TABLE BASED ON THE DISTRIBUTION OF DIFFERENCE VALUES AND RUN LENGTHS
St.8 ENCODING TABLE FOR CASE L-M-N COMPLETE
St.9 ALL L-M-N CASES COMPLETE?
N
Y
END
TRAFFIC-INFORMATION TRANSMITTER
START
St.10 COLLECT TRAFFIC INFORMATION
DETERMINE TRAFFIC INFORMATION PROVISION SECTION
St.11 NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS V=1
St.12 GENERATE SHAPE DATA AROUND THE TRAFFIC-INFORMATION-PROVIDED SECTION V AND SET REFERENCE NODE
St.13 IRREVERSIBLE ENCODING/COMPRESSION OF SHAPE DATA
St.14 DETERMINE TRAFFIC SITUATION AND DETERMINE QUANTIZATION-UNIT
St.15 QUANTIZATION IN THE DIRECTION OF DISTANCE (SECTION SPLITTING)
St.16 CALCULATE TRAFFIC INFORMATION IN EACH UNIT SECTION
St.17 PREPROCESSING OF TRAFFIC INFORMATION
St.18 QUANTIZATION OF TRAFFIC INFORMATION
St.19 CONVERT QUANTIZED TRAFFIC INFORMATION TO STATISTICAL PREDICTION DIFFERENCE VALUE
St.20 VARIABLE LENGTH ENCODING/COMPRESSION OF TRAFFIC INFORMATION REFERRING TO ENCODING TABLE
St.21 CORRECTION OF UNIT (OR EACH) SECTION LENGTH
St.22 V=V+1
St.23 ALL TRAFFIC-INFORMATION-PROVIDED SECTIONS V COMPLETE?
N
Y
St.24 CONVERT TO TRANSMIT DATA
St.25 TRANSMITS DATA TOGETHER WITH ENCODING TABLE
END
RECEIVING PARTY APPARATUS
START
St.30 DATA RECEPTION
St.31 NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS V=1
St.32 DECODE SHAPE DATA, PERFORM MAP MAPPING, AND IDENTIFY TARGET ROAD SECTION
St.33 CORRECTION OF UNIT (OR EACH) SECTION LENGTH
St.34 DECODE TRAFFIC INFORMATION REFERRING TO ENCODING TABLE
St.35 REFLECT TRAVEL TIME IN UNIT (OR EACH) SECTION
St.36 V=V+1
St.37 ALL TRAFFIC-INFORMATION-PROVIDED SECTIONS V COMPLETE?
N
Y
St.38 UTILIZE TRAFFIC-INFORMATION-PROVIDED TRAVEL TIME (DISPLAY OF REQUIRED TIME AND ROUTE GUIDANCE)
END

FIG. 7(a)

EXAMPLE OF MAP DATA STRUCTURE

MANAGEMENT INFORMATION (INFORMATION TYPE/BLOCK DEFINITION, ETC.)	
NO. OF NODES N	
NODE NUMBER 1	
NODE ATTRIBUTE INFORMATION OF NODE 1	
LONGITUDE OF NODE 1	LATITUDE OF NODE 1
NO. OF NODES CONNECTED TO NODE 1	
CONNECTING NODE NUMBER #1	LINK NUMBER #1-1
≀	
CONNECTING NODE NUMBER #m	LINK NUMBER #1-m
≀ ≀	
NODE NUMBER N	
NODE ATTRIBUTE INFORMATION OF NODE N	
LONGITUDE OF NODE N	LATITUDE OF NODE N
NO. OF NODES CONNECTED TO NODE N	
CONNECTING NODE NUMBER #1	LINK NUMBER #N-1
≀	
CONNECTING NODE NUMBER #m	LINK NUMBER #N-m
NO. OF LINK L	
LINK NUMBER 1	
LINK ATTRIBUTE INFORMATION OF LINK 1	
NO. OF COMPONENT INTERPOLATION POINTS OF LINK 1	
LONGITUDE OF INTERPOLATION POINT 1-1	LATITUDE OF INTERPOLATION POINT 1-1
≀	
LONGITUDE OF INTERPOLATION POINT 1-p	LATITUDE OF INTERPOLATION POINT 1-p
≀ ≀	
LINK NUMBER L	
LINK ATTRIBUTE INFORMATION OF LINK L	
NO. OF COMPONENT INTERPOLATION POINTS OF LINK L	
LONGITUDE OF INTERPOLATION POINT L-1	LATITUDE OF INTERPOLATION POINT L-1
~	
LONGITUDE OF INTERPOLATION POINT L-p	LATITUDE OF INTERPOLATION POINT L-p

FIG. 7(b)

EXAMPLE OF TRAFFIC INFORMATION DATA (EXAMPLE OF TRAVEL TIME/SPEED)

MAP DATA LINK NUMBER 1	
CURRENT: TRAVEL TIME	CURRENT: SPEED
5 MINUTES AFTER: TRAVEL TIME	5 MINUTES AFTER: SPEED
10 MINUTES AFTER: TRAVEL TIME	10 MINUTES AFTER: SPEED
≀	
Z MINUTES AFTER: TRAVEL TIME	Z MINUTES AFTER: SPEED
≀ ≀	
MAP DATA LINK NUMBER K	
CURRENT: TRAVEL TIME	CURRENT: SPEED
5 MINUTES AFTER: TRAVEL TIME	5 MINUTES AFTER: SPEED
10 MINUTES AFTER: TRAVEL TIME	10 MINUTES AFTER: SPEED
≀	
Z MINUTES AFTER: TRAVEL TIME	Z MINUTES AFTER: SPEED
≀ ≀	

FIG. 8(a)

SHAPE DATA STRING INFORMATION
(CODING/COMPRESSION DATA)

HEADER INFORMATION	
NO. OF SHAPE DATA N	
SHAPE DATA IDENTIFICATION NUMBER=1	
ENCODING TABLE IDENTIFICATION CODE	
ACCURACY INFORMATION OF MAP DATA AT SHAPE SOURCE	
DIRECTION OF ONE-WAY TRAFFIC (FORWARD/BACKWARD/NONE)	
BEGINNING NODE NUMBER ps	
NODE ps X DIRECTION ABSOLUTE COORDINATE (LONGITUDE)	
NODE ps Y DIRECTION ABSOLUTE COORDINATE (LATITUDE)	
NODE ps ABSOLUTE BEARING	
ps POSITION ERROR (m)	ps BEARING ERROR (°)
MAXIMUM POSITION ERROR OF ENCODED SHAPE DATAT (m)	MAXIMUM BEARING ERROR OF ENCODED SHAPE DATAT (°)
ENCODED SHAPE DATA INCLUDES THE FOLLOWING INFORMATION: · REFERENCE NODE SETTING CODE · SECTION LENGTH CHANGE CODE · EOD CODE	
END NODE NUMBER pe	
NODE pe X DIRECTION RELATIVE COORDINATE (LONGITUDE)	
NODE pe Y DIRECTION RELATIVE COORDINATE (LATITUDE)	
NODE pe ABSOLUTE BEARING	
pe POSITION ERROR (m)	pe BEARING ERROR (°)
≀	
SHAPE DATA IDENTIFICATION NUMBER=M	
≀	

FIG. 8(b)

TRAFFIC INFORMATION

HEADER INFORMATION	
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
REFERENCE SHAPE DATA STRING NUMBER=N	
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)	
BEGINNING REFERENCE NODE Pa	END REFERENCE NODE Pb
DISTANCE DIRECTION QUANTIZED SECTION LENGTH IDENTIFICATION CODE	
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE	
ENCODING TABLE IDENTIFICATION CODE	
NO. OF QUANTIZED UNIT SECTIONS	
TRAFFIC INFORMATION AT THE BEGINNING (INITIAL VALUE)	
TRAFFIC INFORMATION ENCODED BY THE DIFFERENCE VALUE FROM STATISTICAL PREDICTION VALUE. INCLUDES THE FOLLOWING INFORMATION; · SECTION LENGTH CHANGE CODE AND SECTION LENGTH AFTER CHANGE · TRAFFIC INFORMATION QUANTIZATION TABLE CHANGE CODE AND TABLE NUMBER AFTER CHANGE · IDENTIFICATION CODE FOR THE POINT CORRESPONDING TO REFERENCE NODE AND CORRESPONDING REFERENCE NODE NUMBER+OFFSET DISTANCE	
≀	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=W	
≀	

FIG. 9

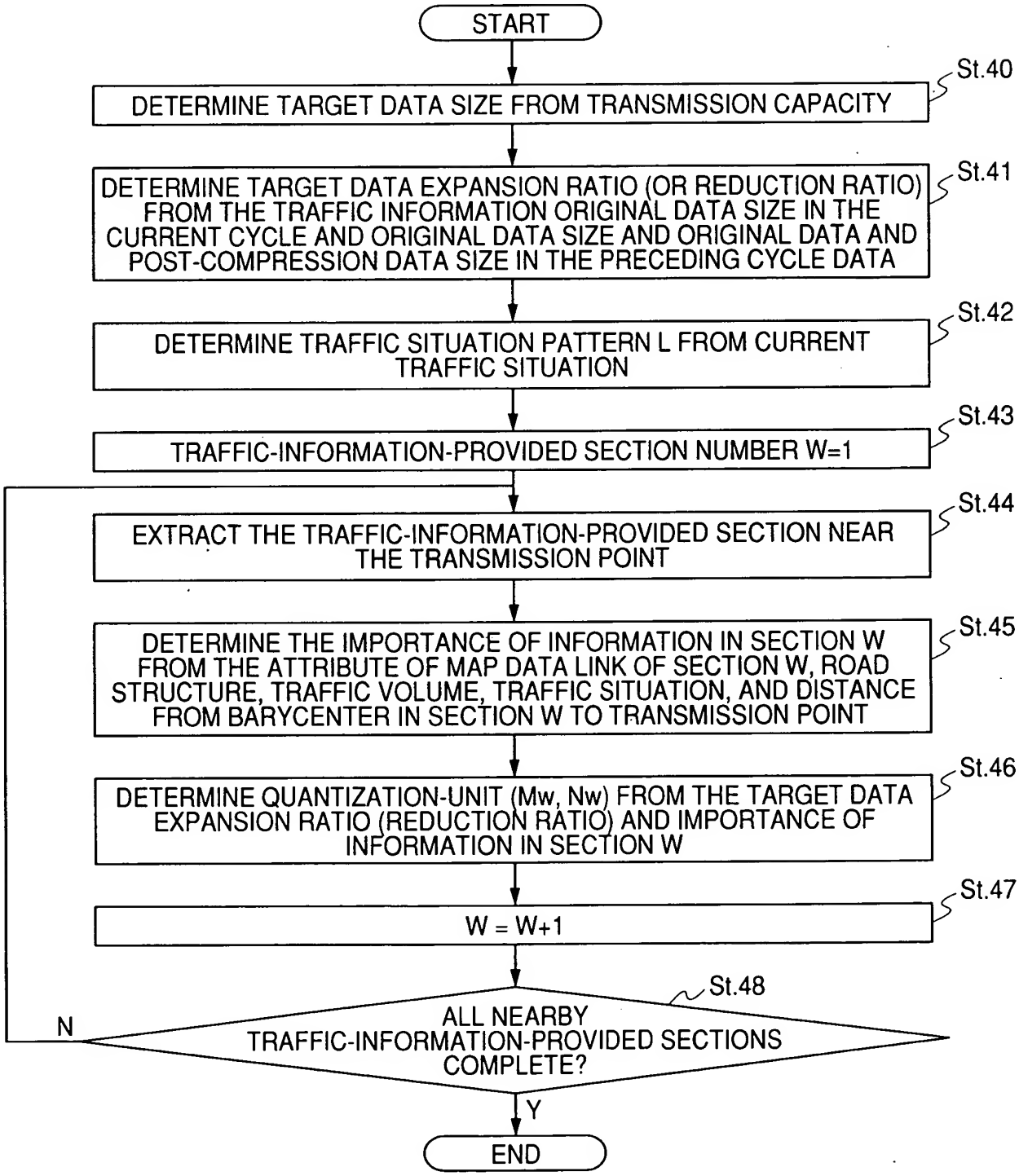

START
St.40
DETERMINE TARGET DATA SIZE FROM TRANSMISSION CAPACITY
St.41
DETERMINE TARGET DATA EXPANSION RATIO (OR REDUCTION RATIO) FROM THE TRAFFIC INFORMATION ORIGINAL DATA SIZE IN THE CURRENT CYCLE AND ORIGINAL DATA SIZE AND ORIGINAL DATA AND POST-COMPRESSION DATA SIZE IN THE PRECEDING CYCLE DATA
St.42
DETERMINE TRAFFIC SITUATION PATTERN L FROM CURRENT TRAFFIC SITUATION
St.43
TRAFFIC-INFORMATION-PROVIDED SECTION NUMBER W=1
St.44
EXTRACT THE TRAFFIC-INFORMATION-PROVIDED SECTION NEAR THE TRANSMISSION POINT
St.45
DETERMINE THE IMPORTANCE OF INFORMATION IN SECTION W FROM THE ATTRIBUTE OF MAP DATA LINK OF SECTION W, ROAD STRUCTURE, TRAFFIC VOLUME, TRAFFIC SITUATION, AND DISTANCE FROM BARYCENTER IN SECTION W TO TRANSMISSION POINT
St.46
DETERMINE QUANTIZATION-UNIT (Mw, Nw) FROM THE TARGET DATA EXPANSION RATIO (REDUCTION RATIO) AND IMPORTANCE OF INFORMATION IN SECTION W
St.47
W = W+1
St.48
ALL NEARBY TRAFFIC-INFORMATION-PROVIDED SECTIONS COMPLETE?
N
Y
END

FIG. 10(a)

TARGET DATA EXPANSION RATIO	IMPORTANCE OF INFORMATION A	IMPORTANCE OF INFORMATION B	IMPORTANCE OF INFORMATION C	REMARKS
DEFAULT	RANK 2	RANK 3	RANK 4	–
×2.0 OR ABOVE	+1 RANK	+2 RANK	+3 RANK	DETAILED
×1.6–1.9	±0 RANK	+1 RANK	+2 RANK	↑
×1.1–1.3	±0 RANK	±0 RANK	+1 RANK	↑
×1.0	±0 RANK	±0 RANK	±0 RANK	NOT CHANGED
×0.7–0.9	±0 RANK	±0 RANK	−1 RANK	↓
×0.6–0.5	±0 RANK	−1 RANK	−2 RANK	↓
×0.4 OR BELOW	−1 RANK	−2 RANK	−3 RANK	SIMPLIFIED

FIG. 10(b)

QUANTIZATION-UNIT RANK	DISTANCE DIRECTION QUANTIZATION-UNIT M	TRAFFIC INFORMATION QUANTIZATION TABLE N	DETAIL LEVEL
RANK 1	50m	TABLE 1	DETAILED
RANK 2	100m	TABLE 2	RATHER DETAILED
RANK 3	150m	TABLE 2	STANDARD
RANK 4	200m	TABLE 3	RATHER COARSE
RANK 5	200m	TABLE 4	COARSE

FIG. 11

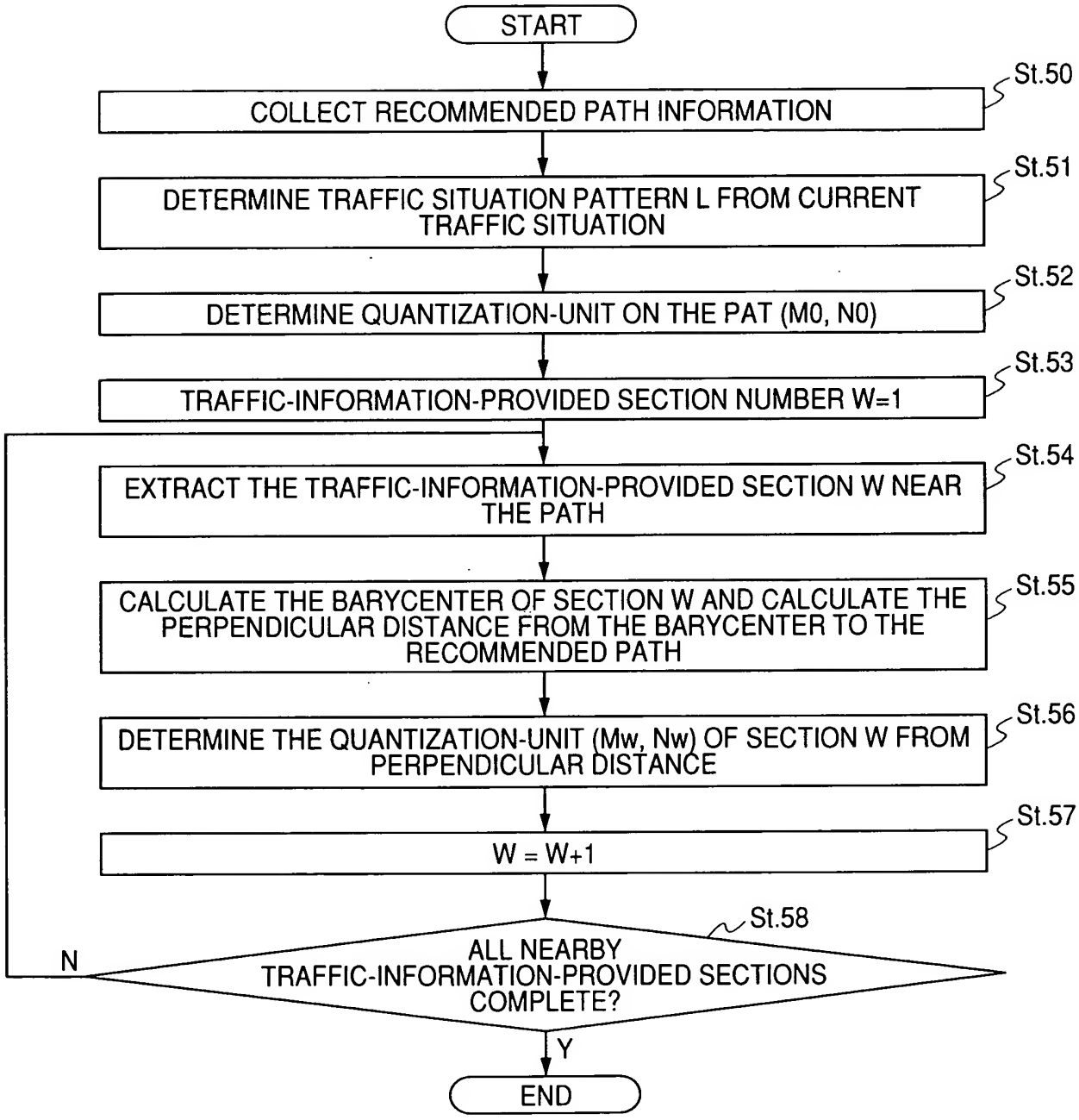

START
St.50
COLLECT RECOMMENDED PATH INFORMATION
St.51
DETERMINE TRAFFIC SITUATION PATTERN L FROM CURRENT TRAFFIC SITUATION
St.52
DETERMINE QUANTIZATION-UNIT ON THE PAT (M0, N0)
St.53
TRAFFIC-INFORMATION-PROVIDED SECTION NUMBER W=1
St.54
EXTRACT THE TRAFFIC-INFORMATION-PROVIDED SECTION W NEAR THE PATH
St.55
CALCULATE THE BARYCENTER OF SECTION W AND CALCULATE THE PERPENDICULAR DISTANCE FROM THE BARYCENTER TO THE RECOMMENDED PATH
St.56
DETERMINE THE QUANTIZATION-UNIT (Mw, Nw) OF SECTION W FROM PERPENDICULAR DISTANCE
St.57
W = W+1
St.58
ALL NEARBY TRAFFIC-INFORMATION-PROVIDED SECTIONS COMPLETE?
N
Y
END

FIG. 12

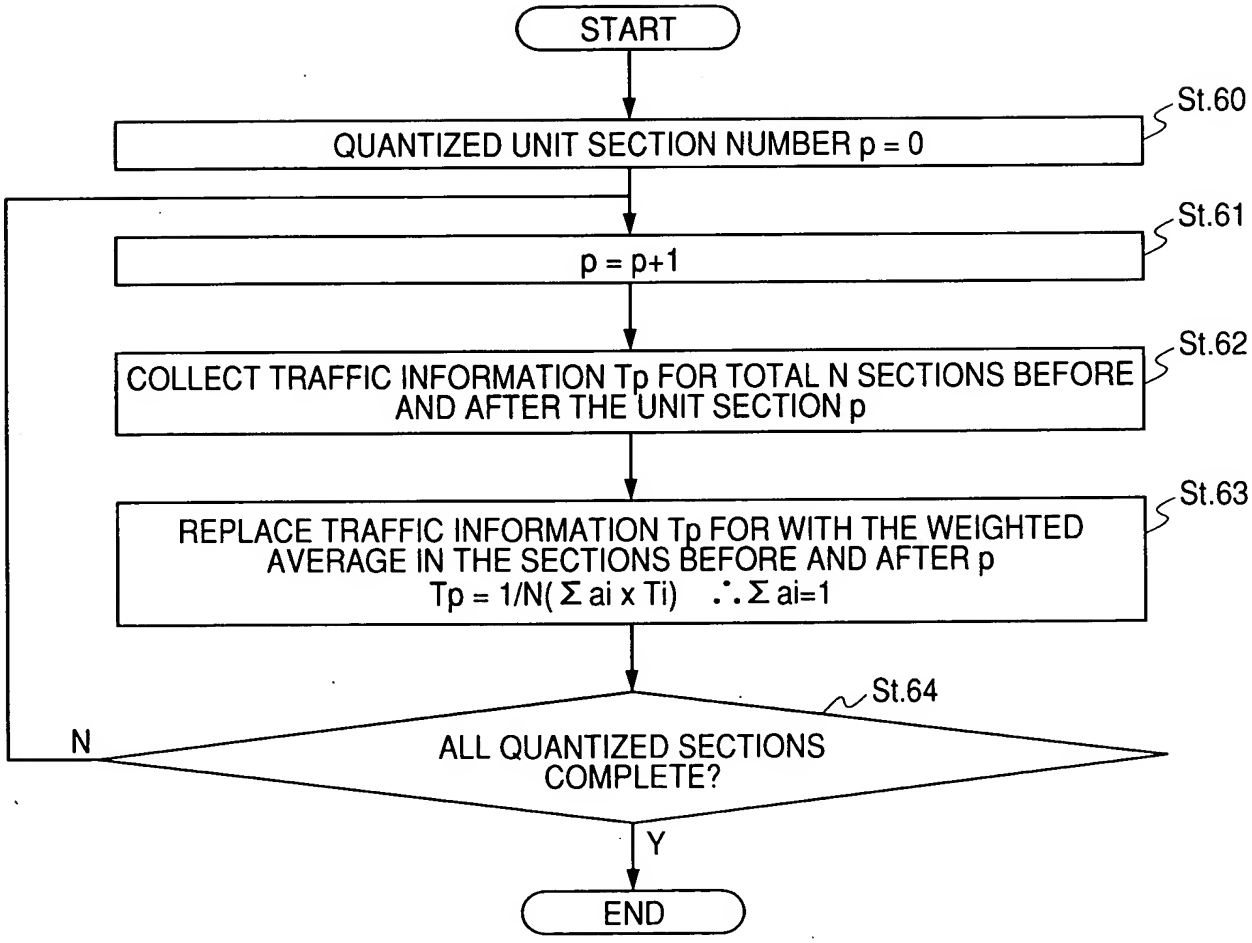

START
St.60
QUANTIZED UNIT SECTION NUMBER p = 0
St.61
p = p+1
St.62
COLLECT TRAFFIC INFORMATION Tp FOR TOTAL N SECTIONS BEFORE AND AFTER THE UNIT SECTION p
St.63
REPLACE TRAFFIC INFORMATION Tp FOR WITH THE WEIGHTED AVERAGE IN THE SECTIONS BEFORE AND AFTER p
Tp = 1/N(Σ ai x Ti) ∴ Σ ai=1
St.64
ALL QUANTIZED SECTIONS COMPLETE?
N
Y
END

FIG. 13(a)

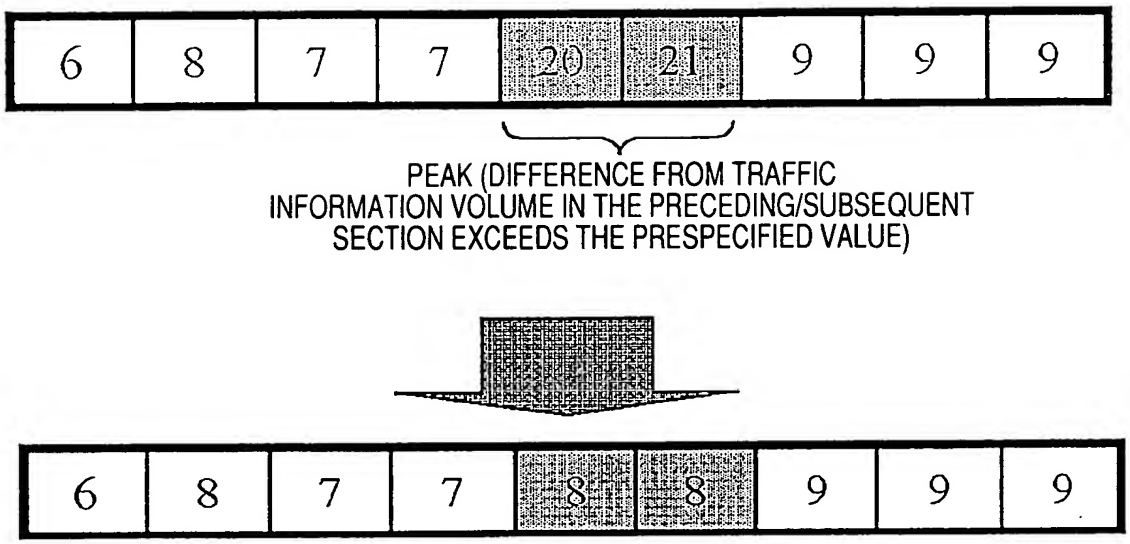


FIG. 13(b)

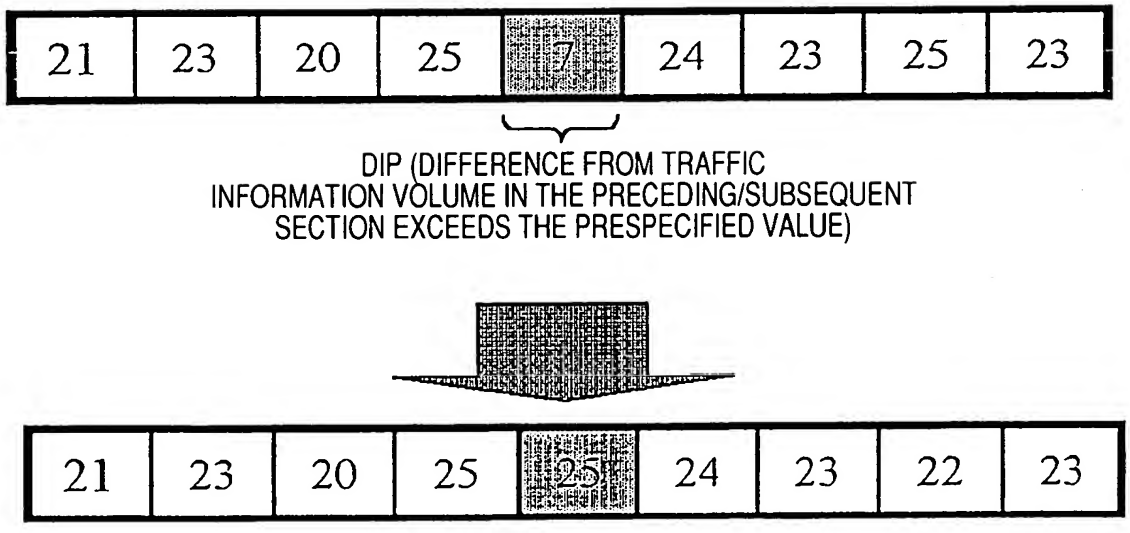


FIG. 14

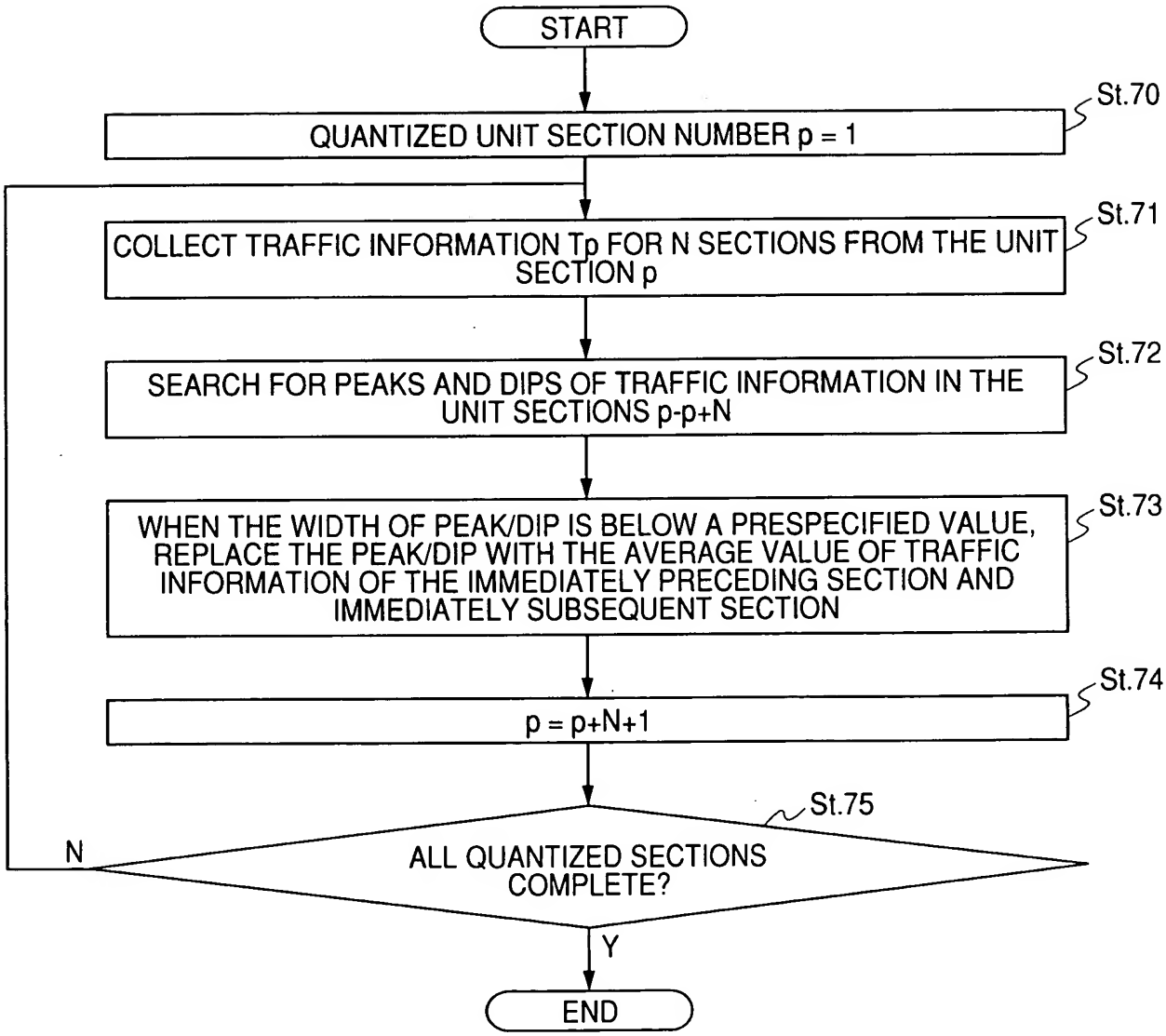

START
St.70
QUANTIZED UNIT SECTION NUMBER p = 1
St.71
COLLECT TRAFFIC INFORMATION Tp FOR N SECTIONS FROM THE UNIT SECTION p
St.72
SEARCH FOR PEAKS AND DIPS OF TRAFFIC INFORMATION IN THE UNIT SECTIONS p-p+N
St.73
WHEN THE WIDTH OF PEAK/DIP IS BELOW A PRESPECIFIED VALUE, REPLACE THE PEAK/DIP WITH THE AVERAGE VALUE OF TRAFFIC INFORMATION OF THE IMMEDIATELY PRECEDING SECTION AND IMMEDIATELY SUBSEQUENT SECTION
St.74
p = p+N+1
St.75
ALL QUANTIZED SECTIONS COMPLETE?
N
Y
END

FIG. 15(a)

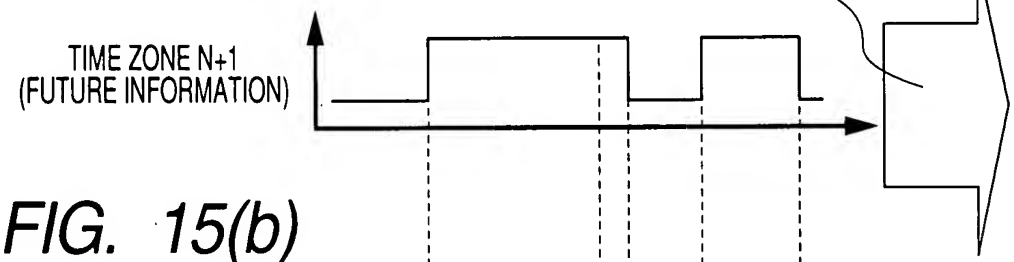


FIG. 15(b)

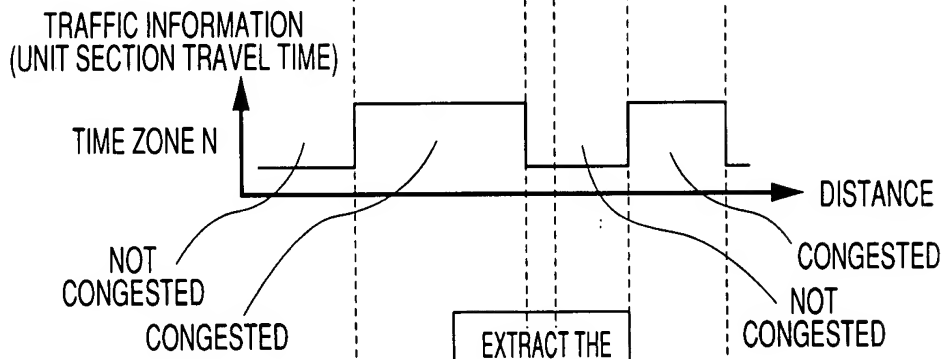


FIG. 15(c)

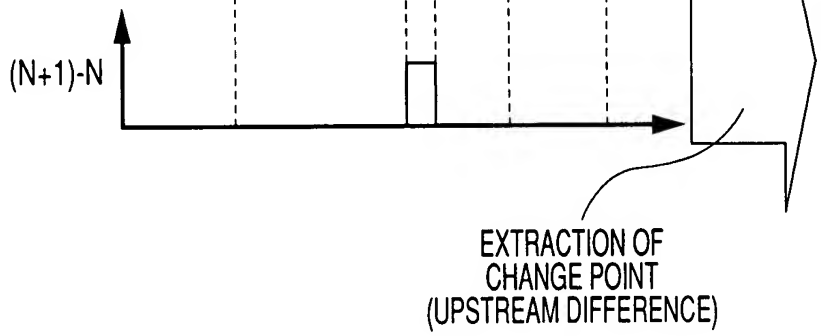


FIG. 15(d)

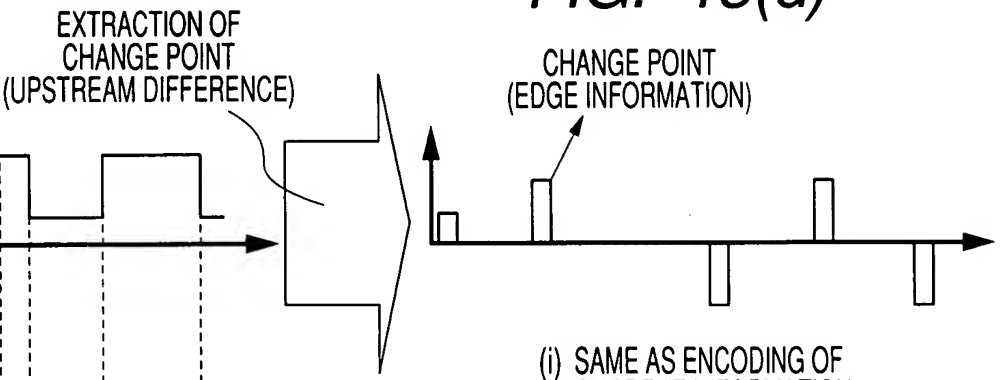
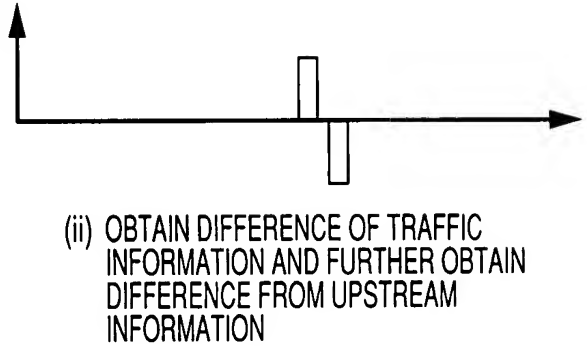


FIG. 15(e)



CALCULATION EXAMPLE OF (ii)

FIG. 16(a)

1. ORIGINAL TRAFFIC INFORMATION (CURRENT MEASUREMENT VALUE+PREDICTION INFORMATION OF NEXT TIME ZONE)

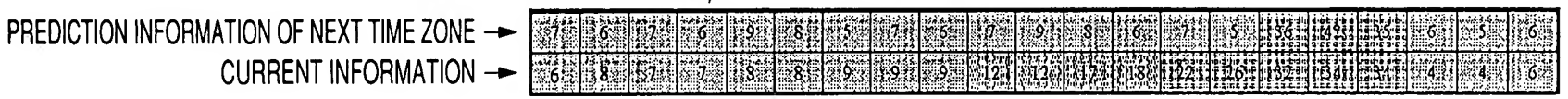


FIG. 16(b)

2. QUANTIZED REPRESENTATION OF TRAFFIC INFORMATION

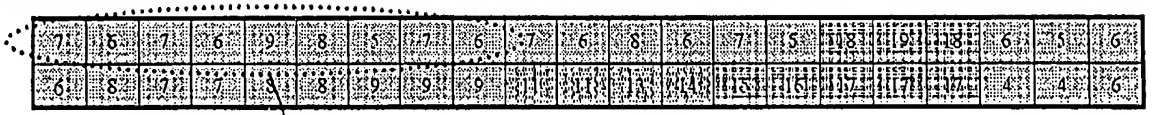


FIG. 16(c)

3. REPRESENT PREDICTION INFORMATION BY THE DIFFERENCE FROM CURRENT INFORMATION (CURRENT INFORMATION IS REPRESENTED BY THE DIFFERENCE FROM AN ADJACENT UNIT SECTION)

CONCENTRATES AROUND ±0 FROM CORRELATION LAW B

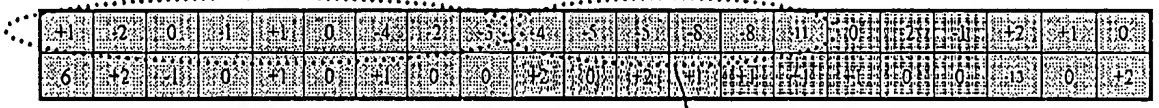


FIG. 16(d)

4. REPRESENT PREDICTION INFORMATION BY THE DIFFERENCE FROM AN ADJACENT UNIT SECTION

CONCENTRATES AROUND ±0 FROM CORRELATION LAW C

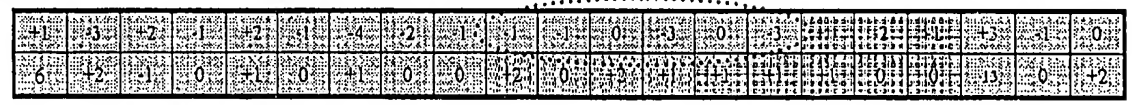


FIG. 17(a)

SPECIAL CODE		CODE	ADDITIONAL BIT	
SECTION LENGTH CHANGE CODE		101	3 (40/80/160/···/5120m)	
TRAFFIC INFORMATION QUANTIZATION TABLE CHANGE CODE		111110	4 (TABLE NUMBER)	
IDENTIFICATION CODE FOR A POINT CORRESPONDING TO REFERENCE NODE		1100	6 (CORRESPONDING REFERENCE NODE NUMBER) + 8 (OFFSET DISTANCE FROM REFERENCE NODE)	
ENCODING TABLE FOR STATISTICAL PREDICTION DIFFERENCE VALUES OF TRAFFIC INFORMATION		CODE	ADDITIONAL BIT I	ADDITIONAL BIT II (RANGE)
RUN LENGTH	CHANGE VOLUME			
0	0	0	0	-
5	0	100	0	-
10	0	1101	0	-
0	±1	1110	1 (±IDENTIFICATION)	0
0	±2	111100	1 (±IDENTIFICATION)	0
0	±4	111101	1 (±IDENTIFICATION)	1 (3 OR 4)
S				

FIG. 17(b)

SPECIAL CODE		CODE	ADDITIONAL BIT	
NOT				
ENCODING TABLE FOR STATISTICAL PREDICTION DIFFERENCE VALUES OF PREDICTION INFORMATION		CODE	ADDITIONAL BIT I	ADDITIONAL BIT II (RANGE)
RUN LENGTH	CHANGE VOLUME			
0	0	0	0	-
5	0	100	0	-
10	0	1101	0	-
0	±1	1110	1 (±IDENTIFICATION)	0
0	±2	111100	1 (±IDENTIFICATION)	0
0	±4	111101	1 (±IDENTIFICATION)	1 (3 OR 4)
S				

FIG. 18

EXAMPLE OF APPARATUS CONFIGURATION
(APPLICATION TO CAR NAVIGATION SYSTEM)

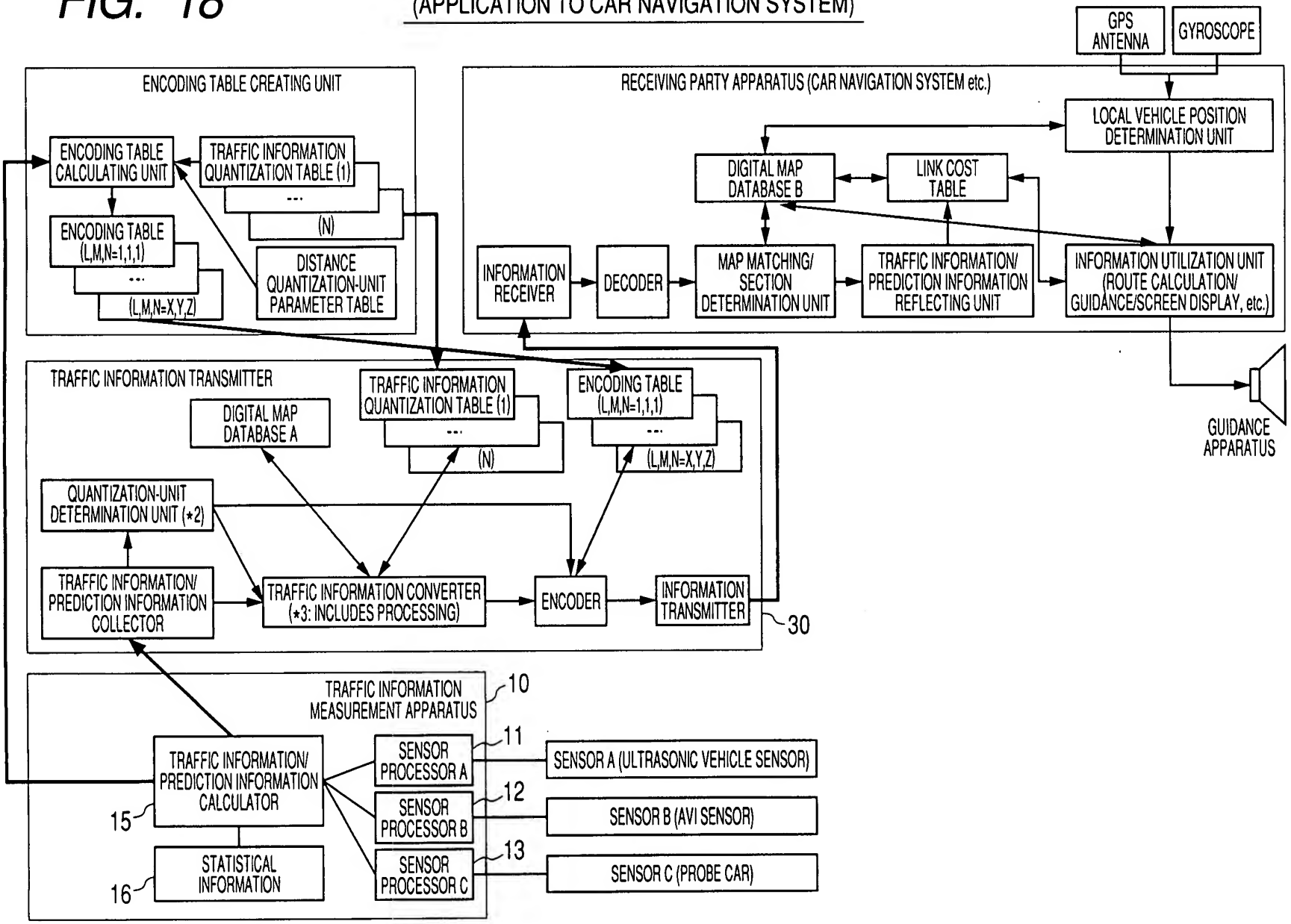


FIG. 19

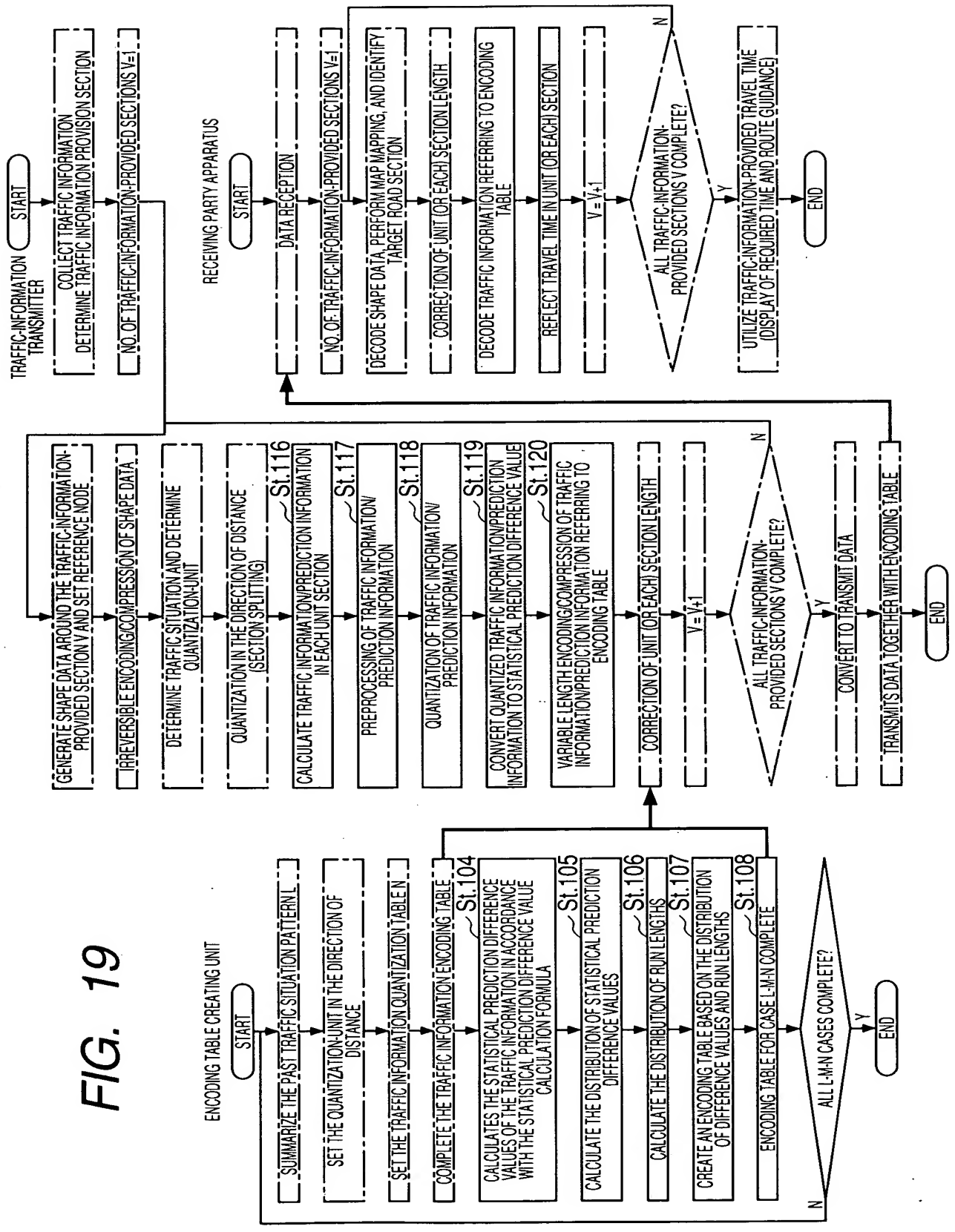

ENCODING TABLE CREATING UNIT
START
SUMMARIZE THE PAST TRAFFIC SITUATION PATTERN L
SET THE QUANTIZATION-UNIT IN THE DIRECTION OF DISTANCE
SET THE TRAFFIC INFORMATION QUANTIZATION TABLE N
COMPLETE THE TRAFFIC INFORMATION ENCODING TABLE
St.104
CALCULATES THE STATISTICAL PREDICTION DIFFERENCE VALUES OF THE TRAFFIC INFORMATION IN ACCORDANCE WITH THE STATISTICAL PREDICTION DIFFERENCE VALUE CALCULATION FORMULA
St.105
CALCULATE THE DISTRIBUTION OF STATISTICAL PREDICTION DIFFERENCE VALUES
St.106
CALCULATE THE DISTRIBUTION OF RUN LENGTHS
St.107
CREATE AN ENCODING TABLE BASED ON THE DISTRIBUTION OF DIFFERENCE VALUES AND RUN LENGTHS
St.108
ENCODING TABLE FOR CASE L-M-N COMPLETE
ALL L-M-N CASES COMPLETE?
N
Y
END
TRAFFIC-INFORMATION TRANSMITTER
START
COLLECT TRAFFIC INFORMATION
DETERMINE TRAFFIC INFORMATION PROVISION SECTION
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS V=1
GENERATE SHAPE DATA AROUND THE TRAFFIC-INFORMATION-PROVIDED SECTION V AND SET REFERENCE NODE
IRREVERSIBLE ENCODING/COMPRESSION OF SHAPE DATA
DETERMINE TRAFFIC SITUATION AND DETERMINE QUANTIZATION-UNIT
QUANTIZATION IN THE DIRECTION OF DISTANCE (SECTION SPLITTING)
St.116
CALCULATE TRAFFIC INFORMATION/PREDICTION INFORMATION IN EACH UNIT SECTION
St.117
PREPROCESSING OF TRAFFIC INFORMATION/ PREDICTION INFORMATION
St.118
QUANTIZATION OF TRAFFIC INFORMATION/ PREDICTION INFORMATION
St.119
CONVERT QUANTIZED TRAFFIC INFORMATION/PREDICTION INFORMATION TO STATISTICAL PREDICTION DIFFERENCE VALUE
St.120
VARIABLE LENGTH ENCODING/COMPRESSION OF TRAFFIC INFORMATION/PREDICTION INFORMATION REFERRING TO ENCODING TABLE
CORRECTION OF UNIT (OR EACH) SECTION LENGTH
V = V+1
ALL TRAFFIC-INFORMATION-PROVIDED SECTIONS V COMPLETE?
N
Y
CONVERT TO TRANSMIT DATA
TRANSMITS DATA TOGETHER WITH ENCODING TABLE
END
RECEIVING PARTY APPARATUS
START
DATA RECEPTION
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS V=1
DECODE SHAPE DATA, PERFORM MAP MAPPING, AND IDENTIFY TARGET ROAD SECTION
CORRECTION OF UNIT (OR EACH) SECTION LENGTH
DECODE TRAFFIC INFORMATION REFERRING TO ENCODING TABLE
REFLECT TRAVEL TIME IN UNIT (OR EACH) SECTION
V = V+1
ALL TRAFFIC-INFORMATION-PROVIDED SECTIONS V COMPLETE?
N
Y
UTILIZE TRAFFIC-INFORMATION-PROVIDED TRAVEL TIME (DISPLAY OF REQUIRED TIME AND ROUTE GUIDANCE)
END

FIG. 20(a)

SHAPE DATA STRING INFORMATION

HEADER INFORMATION
NO. OF SHAPE DATA N
SHAPE DATA IDENTIFICATION NUMBER=1
ENCODING TABLE IDENTIFICATION CODE
ACCURACY INFORMATION OF MAP DATA AT SHAPE SOURCE
DIRECTION OF ONE-WAY TRAFFIC (FORWARD/BACKWARD/NONE)
BEGINNING NODE NUMBER ps
NODE ps X DIRECTION ABSOLUTE COORDINATE (LONGITUDE)
NODE ps Y DIRECTION ABSOLUTE COORDINATE (LATITUDE)
NODE ps ABSOLUTE BEARING
ps POSITION ERROR (m) / ps BEARING ERROR (°)
MAXIMUM POSITION ERROR OF ENCODED SHAPE DATAT (m) / MAXIMUM BEARING ERROR OF ENCODED SHAPE DATAT (°)
ENCODED SHAPE DATA INCLUDES THE FOLLOWING INFORMATION: · REFERENCE NODE SETTING CODE · SECTION LENGTH CHANGE CODE · EOD CODE
END NODE NUMBER pe
NODE pe X DIRECTION RELATIVE COORDINATE (LONGITUDE)
NODE pe Y DIRECTION RELATIVE COORDINATE (LATITUDE)
NODE pe ABSOLUTE BEARING
pe POSITION ERROR (m) / pe BEARING ERROR (°)
⌇
SHAPE DATA IDENTIFICATION NUMBER=M
⌇

FIG. 20(b)

TRAFFIC INFORMATION

HEADER INFORMATION	
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
REFERENCE SHAPE DATA STRING NUMBER=N	
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)	
BEGINNING REFERENCE NODE Pa / END REFERENCE NODE Pb	
DISTANCE DIRECTION QUANTIZED SECTION LENGTH IDENTIFICATION CODE	
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE	
CURRENT INFORMATION: ENCODING TABLE IDENTIFICATION CODE	
PREDICTION INFORMATION: ENCODING TABLE IDENTIFICATION CODE	★
NO. OF QUANTIZED UNIT SECTIONS	
NO. OF TIME ZONES OF PREDICTION INFORMATION	★
EFFECTIVE TIME OF CURRENT INFORMATION (HH:MM)	★
TRAFFIC INFORMATION AT THE BEGINNING (INITIAL VALUE)	
CURRENT TRAFFIC INFORMATION ENCODED USING STATISTICAL PREDICTION DIFFERENCE VALUE FROM AN ADJACENT POINT	
EFFECTIVE TIME OF PREDICTION INFORMATION 1 (HH:MM)	★
PREDICTION TRAFFIC INFORMATION ENCODED USING THE DIFFERENCE FROM PRECEDING TIME ZONE AND STATISTICAL PREDICTION DIFFERENCE VALUE FROM AN ADJACENT POINT	★
⌇	★
EFFECTIVE TIME OF PREDICTION INFORMATION Q (HH:MM)	
PREDICTION TRAFFIC INFORMATION ENCODED USING THE DIFFERENCE FROM PRECEDING TIME ZONE AND STATISTICAL PREDICTION DIFFERENCE VALUE FROM AN ADJACENT POINT	★
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=2	
⌇	

FIG. 21(a)

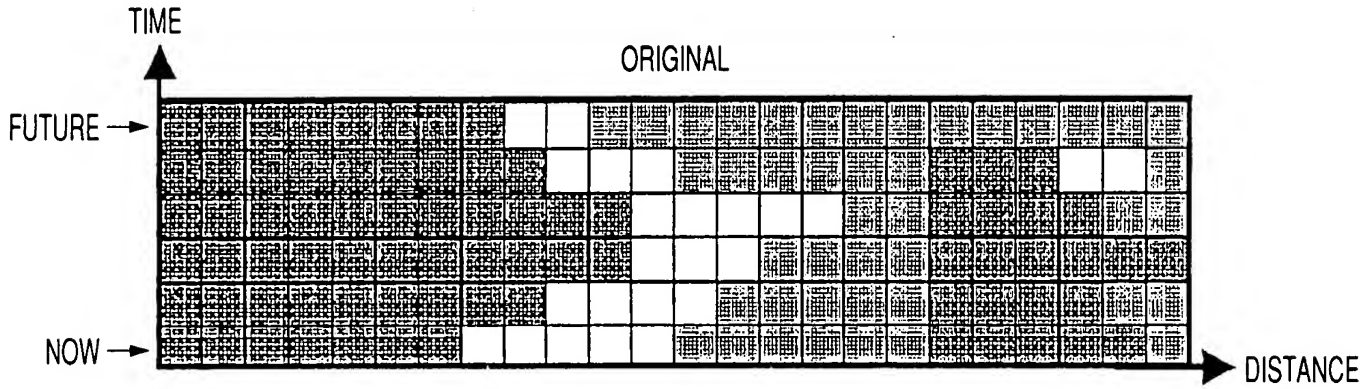


FIG. 21(b)

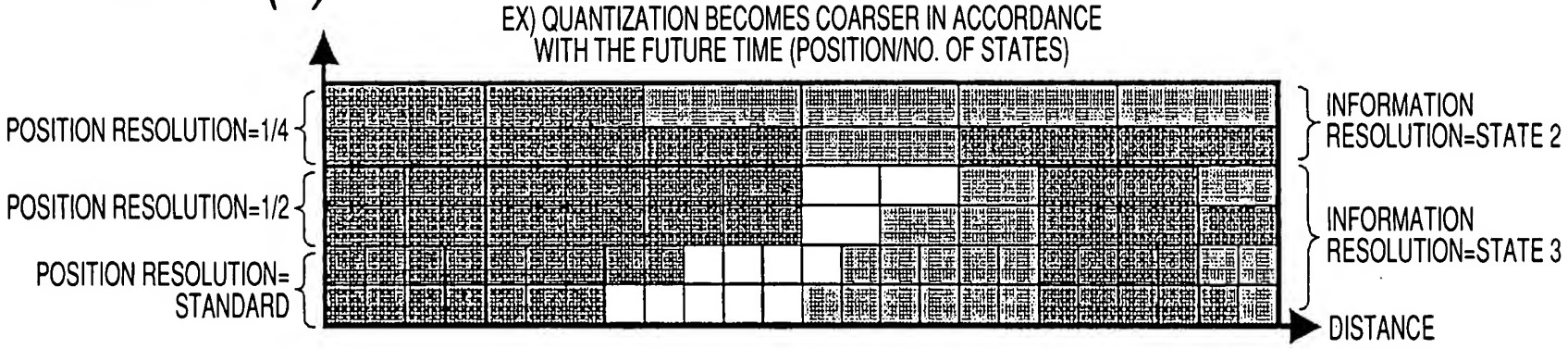


FIG. 22(a)

0. ORIGINAL TRAFFIC INFORMATION (CURRENT MEASUREMENT VALUE+PREDICTION INFORMATION IN THE NEXT TIME ZONE)

PREDICTION INFORMATION IN THE NEXT TIME ZONE (PREDICTION 1) →

CURRENT INFORMATION (NOW) →

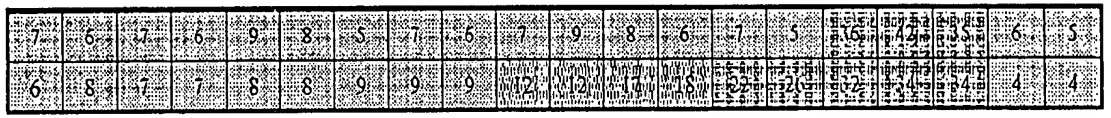


FIG. 22(b)

1. REDUCE THE POSITION RESOLUTION TO HALF (AVERAGE THE TRAFFIC INFORMATION AND ROUND UP THE FRACTIONAL PORTION)

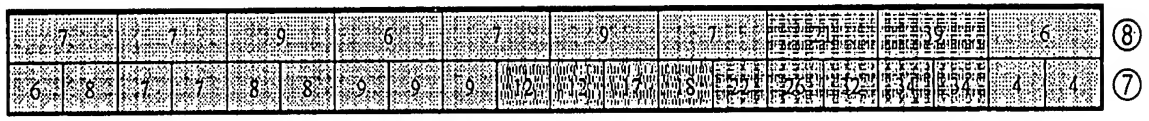


FIG. 22(c)

2. PERFORM QUANTIZATION BY USING A DETAILED QUANTIZATION TABLE

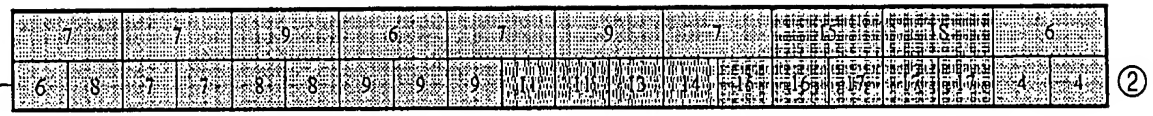


FIG. 22(d)

3. PERFORM QUANTIZATION BY USING A COARSE QUANTIZATION TABLE

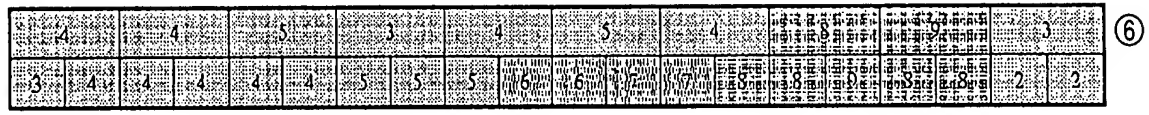


FIG. 22(e)

4. EXTRACT THE DIFFERENCE IN THE DIRECTION OF TIME BY USING A COARSE QUANTIZATION TABLE

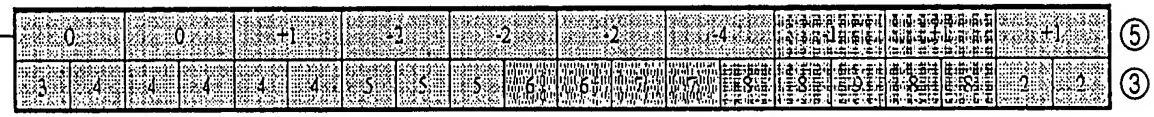


FIG. 22(f)

5. EXTRACT THE DIFFERENCE FROM UPSTREAM BY USING RESPECTIVE QUANTIZATION TABLES

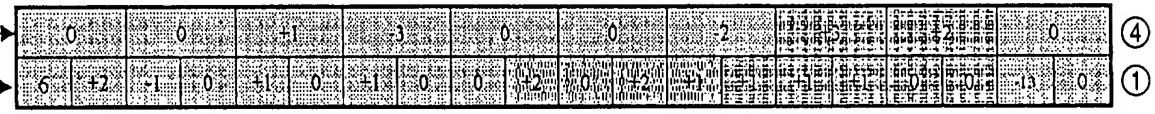


FIG. 23

TRAFFIC INFORMATION QUANTIZATION TABLE
(SPEED QUANTIZATION TABLE)

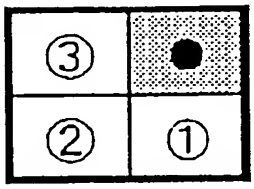
SPEED (km/h)	QUANTIZED VOLUME (CURRENT)	QUANTIZED VOLUME (PREDICTION 1)	QUANTIZED VOLUME (PREDICTION 2)
0	0	0	0
1	1	1	1
2	2		
3	3	2	
4	4		
5	5	3	2
6	6		
7	7	4	
8	8		
9	9	5	3
10~11	10		
12~13	11	6	
14~15	12		
16~17	13	7	4
18~19	14		
20~24	15	8	
25~29	16		
30~34	17	9	5
35~39	18		
40~44	19	10	
45~49	20		
50~59	21	11	6
60~69	22		
70~79	23	12	
80~99	24		
	⟆		
200 OR MORE	30	15	8 (180km/h OR MORE)

FIG. 24

TRAFFIC INFORMATION

HEADER INFORMATION		
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS		
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1		
REFERENCE SHAPE DATA STRING NUMBER=N		
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)		
BEGINNING REFERENCE NODE Pa	END REFERENCE NODE Pb	
DISTANCE DIRECTION QUANTIZED SECTION LENGTH IDENTIFICATION CODE		
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE		
CURRENT INFORMATION: ENCODING TABLE IDENTIFICATION CODE		
PREDICTION INFORMATION: ENCODING TABLE IDENTIFICATION CODE		
NO. OF QUANTIZED UNIT SECTIONS		
NO. OF TIME ZONES OF PREDICTION INFORMATION		
EFFECTIVE TIME OF CURRENT INFORMATION (HH:MM)		
TRAFFIC INFORMATION AT THE BEGINNING (INITIAL VALUE)		
CURRENT TRAFFIC INFORMATION ENCODED BY THE DIFFERENCE VALUE FROM STATISTICAL PREDICTION VALUE		
EFFECTIVE TIME OF PREDICTION INFORMATION 1 (HH:MM)		
POSITION RESOLUTION IDENTIFICATION CODE	QUANTIZATION TABLE NUMBER	★
PREDICTION TRAFFIC INFORMATION ENCODED BY THE DIFFERENCE VALUE FROM STATISTICAL PREDICTION VALUE		
≀		
EFFECTIVE TIME OF PREDICTION INFORMATION Q (HH:MM)		
POSITION RESOLUTION IDENTIFICATION CODE	QUANTIZATION TABLE NUMBER	★
PREDICTION TRAFFIC INFORMATION ENCODED BY THE DIFFERENCE VALUE FROM STATISTICAL PREDICTION VALUE		
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=2		
≀		

FIG. 25



STATISTICAL PREDICTION VALUE OF ● = a① +b② +c③ (WHERE a+b+c=1)

OR = (① + ③) ÷ 2

FIG. 26

①

ORIGINAL TRAFFIC INFORMATION DATA	
SPEED INFORMATION	CONGESTION INFORMATION
6	10
8	10
7	10
7	10
8	10
8	10
9	10
9	10
9	10
12	20
12	20
17	20
18	20
22	20
26	20
32	20
34	20
34	20
4	10
4	10
6	10
7	10
41	40
46	40
46	40
38	40
43	40
44	40
40	40
45	40
48	40
43	40

⇒

②

FFT PROCESSING ON THE TRANSMITTER (ENCODER)	
IMAGINARY REPRESENTATION OF ORIGINAL DATA	FFT COEFFICIENT AFTER FFT
6+10i	733+710i
8+10i	-148.621280158602+272.745598987757i
7+10i	-181.86325303236 99+137.3433154572 37i
7+10i	-55.471398331421 1-53.448427716888 3i
8+10i	26.941125496954 4+120.225396744416i
8+10i	-145.189119855325+0.9617161835335 75i
9+10i	0.190731976517859-15.52228728194 33i
9+10i	-40.901700166551 3+42.915181946787 6i
9+10i	-43-1.999999999999999i
12+20i	-54.887893546591 6-20.304825351750 9i
12+20i	-14.587474151544 5-8.381472228710 13i
17+20i	-39.751338029535 3+5.302463594710 74i
18+20i	-9.225396744416 2-52.343145750507 5i
22+20i	-10.710073329952 1+24.672218468553 5i
26+20i	-54.856417714775 6-9.858025483682 02i
32+20i	6.725474242213 85-31.684956766628 3i
34+20i	-19-10i
34+20i	-23.988546376803 7-1.924752313387 96i
4+10i	-27.131696042417 4-35.603200087059 2i
4+10i	19.541094206339 5-19.877334580854 7i
6+10i	-40.941125496954 3-4.225396744416 14i
7+10i	3.863496859861 286-50.425876865859 i
41+40i	7.382861152289 4+26.115216394506 6i
46+40i	-45.996803395598 7-35.265903073641 5i
46+40i	-3.000000000000002-58i
38+40i	6.811428582982 11-29.378936132770 5i
43+40i	3.582423517661 13+2.641356585532 56i
44+40i	-40.769151334215 6-119.976701296968i
40+40i	115.225396744416-63.656854249492 5i
45+40i	-91.278012172320 7+19.654857223924 5i
48+40i	147.282824585968-256.724903628891i
43+40i	212.623822808768-163.964322106518i

⇒

③ ④

QUANTIZATION TABLE	TRANSMIT DATA	
	FFT REAL PART QUANTIZATION COEFFICIENT	FFT IMAGINARY PART QUANTIZATION COEFFICIENT
4	183	178
4	-37	68
4	-45	34
4	-14	-13
4	7	30
4	-36	0
8	0	-2
8	-5	5
8	-5	0
8	-7	-3
8	-2	-1
8	-5	1
16	-1	-3
16	-1	2
16	-3	-1
16	0	-2
16	-1	-1
16	-1	0
32	-1	-1
32	1	-1
32	-1	0
32	0	-2
32	0	1
32	-1	-1
32	0	-2
32	0	-1
64	0	0
64	-1	-2
64	2	-1
64	-1	0
64	2	-4
64	3	-3

⇒

⑤

INVERSE FFT PROCESSING ON THE RECEIVER (DECODER)	
IMAGINARY REPRESENTATION OF RECEIVED DATA	INVERSE FFT COEFFICIENT AFTER INVERSE FFT
732+712i	5.75+7.625i
-148+272i	5.805325482033 67+8.520673053211 67i
-180+136i	6.234205377071 97+10.500569333679 13i
-56-52i	4.981012297262 06+9.379632941272 72i
28+120i	6.573223304700 37+9.698223304703 36i
-144	6.426025446382 39+10.267877523128 6i
-16i	5.422127898816 37+11.570897252652i
-40+40i	9.603034788975 02+13.543644947855 9i
-40	10.25+11.375i
-56-24i	12.336327392568 9+20.498072250078 6i
-16-8i	13.183549755522+21.844394771475i
-40+8i	18.448214185623 1+17.856928230302 4i
-16-48i	17.436291501015 2+18.518398282201 8i
-16+32i	18.481928501216 8+20.272236981084 2i
-48-16i	25.959898573464 8+21.247745800179 6i
-32i	30.978345687356 5+20.962686730029 8i
-16-16i	34+22.375i
-16	35.424501790748 7+21.575824908153 7i
-32-32i	3.711600929661 91+9.773664094688 66i
32-32i	5.590456984335 84+12.573603664432 1i
-32	6.926776695296 64+10.051776695296 6i
-64i	8.674334167131 55+12.934738513764 3i
32i	43.776726735122 4+38.759665364932 1i
-32-32i	47.648662535459+39.205807170395 2i
-64i	48+38.625i
-32i	37.944252974734 3+37.173196741522 4i
0	42.370643937744 1+38.381371791372 5i
-64-128i	42.428270332350 8+39.572820806 1088i
128-64i	40.063708498984 7+39.731601717799 2i
-64	45.907006245183 8+40.757380029056 4i
128-256i	48.341246792596 4+37.921671582236 4i
192-192i	43.321995209637 7+38.904870509603 1i

⇒

⑥

REPRODUCED TRAFFIC INFORMATION DATA	
SPEED INFORMATION	CONGESTION INFORMATION
6	8
6	9
6	11
5	9
7	10
6	10
5	12
10	14
10	11
12	20
13	22
18	18
17	19
18	20
26	21
31	21
34	22
35	22
4	10
6	13
7	10
9	13
44	39
48	39
48	39
38	37
42	38
42	40
40	40
46	41
48	38
43	39

⑦

DIFFERENCE BETWEEN ORIGINAL DATA AND REPRODUCED DATA	
SPEED INFORMATION	CONGESTION INFORMATION
0	-2
-2	-1
-1	1
-2	-1
-1	0
-2	0
-4	2
1	4
1	1
0	0
1	2
1	-2
-1	-1
-4	0
0	1
-1	1
0	2
1	2
0	0
2	3
1	0
2	3
3	-1
2	-1
2	-1
0	-3
-1	-2
-2	0
0	0
1	1
0	-2
0	-1

FIG. 27

① ORIGINAL TRAFFIC INFORMATION DATA

SPEED INFORMATION	CONGESTION INFORMATION
6	10
8	10
7	10
7	10
8	10
8	10
8	10
9	10
9	10
9	10
12	20
12	20
17	20
18	20
22	20
26	20
32	20
34	20
34	20
4	10
4	10
6	10
7	10
41	40
46	40
46	40
38	40
43	40
44	40
40	40
45	40
48	40
43	40

⇒

② FFT PROCESSING ON THE TRANSMITTER (ENCODER)

IMAGINARY REPRESENTATION OF ORIGINAL DATA	FFT COEFFICIENT AFTER FFT
6+10i	733+710i
8+10i	-148.621280158602+272.7455989877571i
7+10i	-181.863253323699+137.3433154572371i
7+10i	-55.471398331421 1-53.448427716888 3i
8+10i	26.941125496954 4+120.2253967444161i
8+10i	-145.189119855325+0.9617161835335751i
9+10i	0.190731976517859-15.52228728194331i
9+10i	-40.90170016655131+42.91518194678761i
9+10i	-43-1.9999999999999 9i
12+20i	-54.88788935485916-20.304825351750 9i
12+20i	-14.58747415154451-8.381472228710131i
17+20i	-39.751338029535 3+5.302463594710741i
18+20i	-9.2253967444162-52.343145750350751i
22+20i	-10.710073329952 1+24.672218468553351i
26+20i	-54.956417714775 6-9.868025483682021i
32+20i	6.725474242213851-31.684956766628 3i
34+20i	-19-10i
34+20i	-23.988546376803 7-1.924752313387961i
4+10i	-27.131696042417 4-35.603200087059 2i
4+10i	19.541094206339 5-19.877334580854 7i
6+10i	-40.941125496954 3-4.225396744416 4i
7+10i	3.863496858612 86-50.425876865859i
41+40i	7.382861152289 4+26.115216394506 6i
46+40i	-45.996803395598 7-35.265903073641 5i
46+40i	-3.000000000000002-58i
38+40i	6.811428589829 11-29.378936132770 5i
43+40i	3.582423517661 13+2.641356858532 56i
44+40i	-40.769151334215 6-119.976701296968i
40+40i	115.225396744416-63.656854249492 5i
45+40i	-91.278012172320 7+19.654857223924 5i
48+40i	147.282824585968-256.724903628881i
43+40i	212.623822808768-163.964322106518i

⇒

③ QUANTIZATION TABLE

④ TRANSMIT DATA

QUANTIZATION TABLE	FFT REAL PART QUANTIZATION COEFFICIENT	FFT IMAGINARY PART QUANTIZATION COEFFICIENT
1	733	710
1	-149	273
1	-182	137
1	-55	-53
1	27	120
1	-145	1
1	0	-16
1	-41	43
2	-22	-1
2	-27	-10
2	-7	-4
2	-20	3
2	-5	-26
2	-5	12
2	-27	-5
2	3	-16
4	-5	-3
4	-6	0
4	-7	-9
4	5	-5
4	-10	-1
4	1	-13
4	2	7
4	-11	-9
8	0	-7
8	1	-4
8	0	0
8	-5	-15
8	14	-8
8	-11	2
8	18	-32
8	27	-20

⇒

⑤ INVERSE FFT PROCESSING ON THE RECEIVER (DECODER)

IMAGINARY REPRESENTATION OF RECEIVED DATA	INVERSE FFT COEFFICIENT AFTER INVERSE FFT
733+710i	6.125+9.90625i
-149+273i	7.835848553077 4+9.914048260840 1i
-182+137i	6.761931830999 66+10.23779538744i
-55-53i	7.328351279187 87+10.506277312075 1i
27+120i	8.209327650307 35+9.981694173824 15i
-145+i	8.185805818593 86+9.768207675336 22i
-16i	8.759200657707 12+9.951946595704 65i
-41+43i	9.366553087448 02+10.393943476779 4i
-44-2i	9.437500000000 01+10.00125i
-54-20i	12.37850262900 64+19.611597488120 6i
-14-8i	12.138494742361 5+19.658801032163 9i
-40+6i	17.096921808357 6+19.766891185662i
-10-52i	17.876012370136+19.76525749897091
-10+24i	22.242282960349 9+19.802622065421 9i
-54-10i	25.866673492188 3+19.278586074977 9i
6-32i	31.361859924867 5+19.744220432985i
-20-12i	33.375+20.03125i
-24	33.859203656747+20.21441168799 71i
-28-36i	3.909287083097 59+10.069908913200 8i
20-20i	4.014150429446 84+10.521871451528 6i
-40-4i	6.353172349692 66+9.893305826175 83i
4-52i	7.015661941587 6+9.935828632955 67i
8+28i	40.988289888297 4+39.668388457462i
-44-36i	45.730964499461 6+40.248351772524 4i
-56i	45.8125+40.03125i
8-32i	37.986027486530 2+40.048078378995 6i
0	42.815286343542 2+40.158494667235 2i
-40-120i	43.709363497304 2+40.194105993465i
112-64i	40.061487629853 9+40.359742501029 1i
-88+16i	45.246666854107 8+40.185205810332 1i
144-256i	48.010835971807 2+39.976078871853 5i
216-160i	43.141825473926 3+40.124338374980 5i

⇒

⑥ REPRODUCED TRAFFIC INFORMATION DATA

SPEED INFORMATION	CONGESTION INFORMATION
6	10
8	10
7	10
7	11
8	10
8	10
9	10
9	10
9	10
12	20
12	20
17	20
18	20
22	20
26	19
31	20
33	20
34	20
4	10
4	11
6	10
7	10
41	40
46	40
46	40
38	40
43	40
44	40
40	40
45	40
48	40
43	40

⑦ DIFFERENCE BETWEEN ORIGINAL DATA AND REPRODUCED DATA

SPEED INFORMATION	CONGESTION INFORMATION
0	0
0	0
0	0
0.	1
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	-1
-1	0
-1	0
0	0
0	0
0	1
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0

FIG. 28

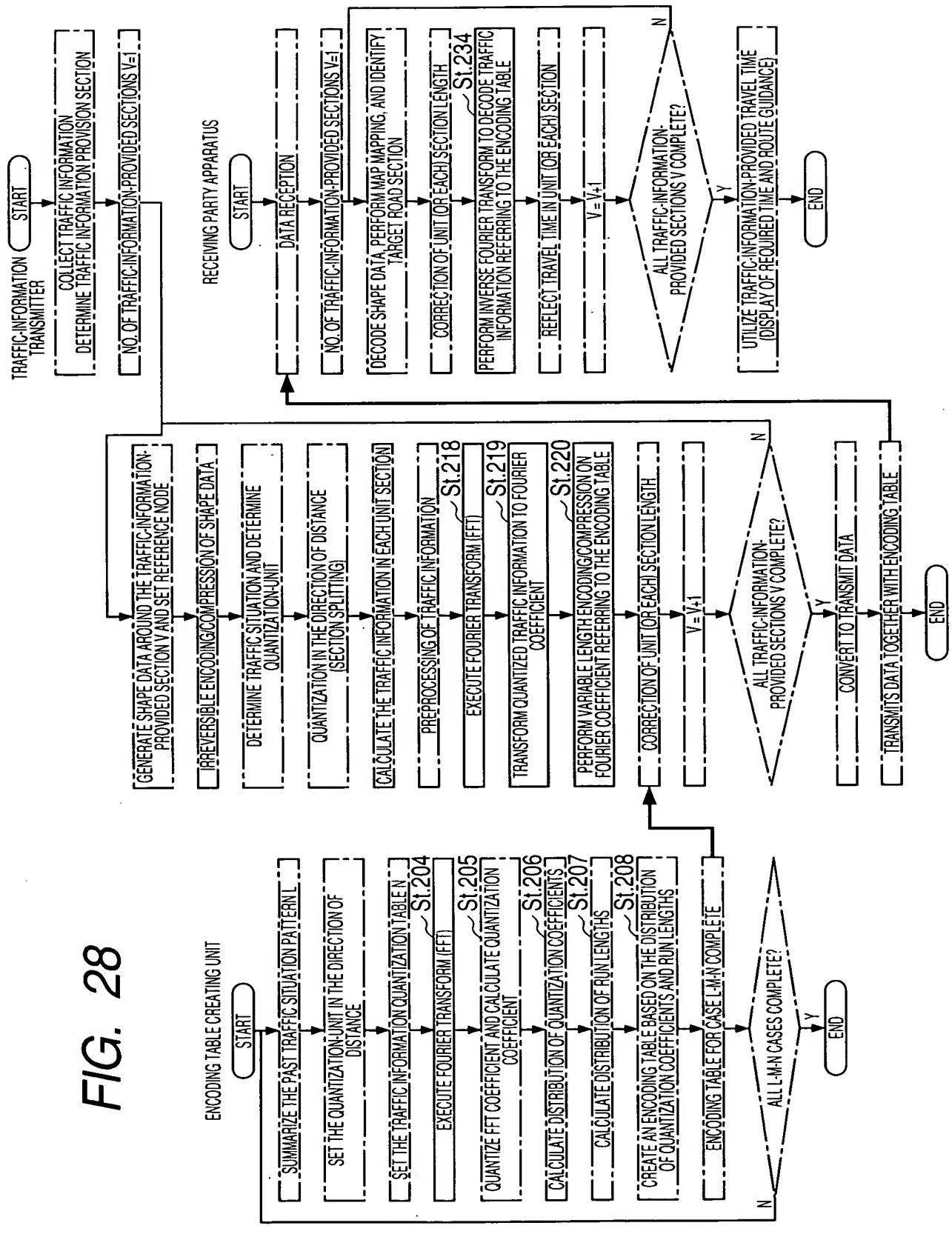

ENCODING TABLE CREATING UNIT
START
SUMMARIZE THE PAST TRAFFIC SITUATION PATTERN L
SET THE QUANTIZATION-UNIT IN THE DIRECTION OF DISTANCE
SET THE TRAFFIC INFORMATION QUANTIZATION TABLE N
St.204
EXECUTE FOURIER TRANSFORM (FFT)
St.205
QUANTIZE FFT COEFFICIENT AND CALCULATE QUANTIZATION COEFFICIENT
St.206
CALCULATE DISTRIBUTION OF QUANTIZATION COEFFICIENTS
St.207
CALCULATE DISTRIBUTION OF RUN LENGTHS
St.208
CREATE AN ENCODING TABLE BASED ON THE DISTRIBUTION OF QUANTIZATION COEFFICIENTS AND RUN LENGTHS
ENCODING TABLE FOR CASE L-M-N COMPLETE
ALL L-M-N CASES COMPLETE?
N
Y
END
TRAFFIC-INFORMATION TRANSMITTER
START
COLLECT TRAFFIC INFORMATION
DETERMINE TRAFFIC INFORMATION PROVISION SECTION
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS V=1
GENERATE SHAPE DATA AROUND THE TRAFFIC-INFORMATION-PROVIDED SECTION V AND SET REFERENCE NODE
IRREVERSIBLE ENCODING/COMPRESSION OF SHAPE DATA
DETERMINE TRAFFIC SITUATION AND DETERMINE QUANTIZATION-UNIT
QUANTIZATION IN THE DIRECTION OF DISTANCE (SECTION SPLITTING)
CALCULATE THE TRAFFIC INFORMATION IN EACH UNIT SECTION
PREPROCESSING OF TRAFFIC INFORMATION
St.218
EXECUTE FOURIER TRANSFORM (FFT)
St.219
TRANSFORM QUANTIZED TRAFFIC INFORMATION TO FOURIER COEFFICIENT
St.220
PERFORM VARIABLE LENGTH ENCODING/COMPRESSION ON FOURIER COEFFICIENT REFERRING TO THE ENCODING TABLE
CORRECTION OF UNIT (OR EACH) SECTION LENGTH
V = V+1
ALL TRAFFIC-INFORMATION-PROVIDED SECTIONS V COMPLETE?
N
Y
CONVERT TO TRANSMIT DATA
TRANSMITS DATA TOGETHER WITH ENCODING TABLE
END
RECEIVING PARTY APPARATUS
START
DATA RECEPTION
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS V=1
DECODE SHAPE DATA, PERFORM MAP MAPPING, AND IDENTIFY TARGET ROAD SECTION
CORRECTION OF UNIT (OR EACH) SECTION LENGTH
St.234
PERFORM INVERSE FOURIER TRANSFORM TO DECODE TRAFFIC INFORMATION REFERRING TO THE ENCODING TABLE
REFLECT TRAVEL TIME IN UNIT (OR EACH) SECTION
V = V+1
ALL TRAFFIC-INFORMATION-PROVIDED SECTIONS V COMPLETE?
N
Y
UTILIZE TRAFFIC-INFORMATION-PROVIDED TRAVEL TIME (DISPLAY OF REQUIRED TIME AND ROUTE GUIDANCE)
END

FIG. 29

EXAMPLE OF TRAFFIC INFORMATION IN FFT REPRESENTATION

HEADER INFORMATION	
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
REFERENCE SHAPE DATA STRING NUMBER=N	
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)	
BEGINNING REFERENCE NODE Pa	END REFERENCE NODE Pb
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE	
ENCODING TABLE IDENTIFICATION CODE	
AMOUNT OF SECTION SPLITTING BETWEEN REFERENCE NODES 2^N	
DATA STRING WHERE FOURIER COEFFICIENTS ARE VARIABLE LENGTH ENCODED IN THE ORDER OF REAL PART TO IMAGINARY PART, AND LOW FREQUENCIES TO HIGH FREQUENCIES	
⌇	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=W	
⌇	

FIG. 30

EXAMPLE OF ENCODING TABLE OF FFT COEFFICIENTS

SPECIAL CODE		CODE	ADDITIONAL BIT	
EOD CODE		1100	NOT	
ENCODING TABLE		CODE	ADDITIONAL BIT I	ADDITIONAL BIT II (RANGE)
RUN LENGTH	FFT COEFFICIENTS			
0	0	0	0	–
5	0	100	0	–
10	0	1101	0	–
0	±1	1110	1 (±IDENTIFICATION)	0
0	±2	111100	1 (±IDENTIFICATION)	0
0	±3-6	111101	1 (±IDENTIFICATION)	2 (3/4/5/6 IDENTIFICATION)
⟆				

FIG. 31(a)

EXAMPLE OF TRAFFIC INFORMATION IN FFT REPRESENTATION 2
(LOW FREQUENCY COMPONENT/HIGH FREQUENCY COMPONENT SPLIT TYPE)

HEADER INFORMATION	
NO. OF THIS INFORMATION	AMOUNT OF TRAFFIC INFORMATION SPLITTING
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
REFERENCE SHAPE DATA STRING NUMBER=N	
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)	
BEGINNING REFERENCE NODE Pa	END REFERENCE NODE Pb
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE	
ENCODING TABLE IDENTIFICATION CODE	
AMOUNT OF SECTION SPLITTING BETWEEN REFERENCE NODE 2^N	
DATA STRING WHERE FOURIER COEFFICIENTS ARE VARIABLE LENGTH ENCODED IN THE ORDER OF REAL PART TO IMAGINARY PART, COEFFICIENTS OF BASE FUNCTION TO HIGHT FREQUENCIES	
≀	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=W	
≀	

BASIC INFORMATION & INFORMATION ON FFT COEFFICIENTS OF LOW FREQUENCY COMPONENT

FIG. 31(b)

HEADER INFORMATION	
NO. OF THIS INFORMATION ※	AMOUNT OF TRAFFIC INFORMATION SPLITTING ※
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
DATA STRING WHERE FOURIER COEFFICIENTS ARE VARIABLE LENGTH ENCODED IN THE ORDER OF REAL PART TO IMAGINARY PART, COEFFICIENTS OF BASE FUNCTION TO HIGHT FREQUENCIES	
≀	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=W	
≀	

INFORMATION ON FFT COEFFICIENTS OF HIGH FREQUENCY COMPONENT (PART OF SUBSECTIONS)

FIG. 32(a)

ORDINARY DATA TRANSMISSION ORDER
(DATA IS SEQUENTIALLY TRANSMITTED IN THE ORDER TO LOW FREQUENCY COMPONENTS TO HIGH FREQUENCY COMPONENTS IN ASCENDING ORDER OF SECTION NUMBER)

INFORMATION (FFT COEFFICIENT) IN SECTION NO.=1		INFORMATION (FFT COEFFICIENT) IN SECTION NO.=2		INFORMATION (FFT COEFFICIENT) IN SECTION NO.=V	
REAL PART	IMAGINARY PART	REAL PART	IMAGINARY PART	REAL PART	IMAGINARY PART
45	64	-13	87	53	16
34	-22	8	-32	-89	45
25	-7	5	27	14	-22
0	6	-4	-4	0	19
-2	0	0	3	1	-21
-14	0	-1	0	-4	-6
3	-4	2	-9	0	0
0	0	3	0	-5	-3
0	1	0	6	9	0
0	12	0	8	8	0
-2	-5	4	12	4	6
0	0	0	0	0	-12
-1	0	2	0	3	0
3	1	-4	3	5	-3
-2	-7	0	-2	0	0
0	0	0	-1	1	4
0	1	0	7	-3	0
0	0	3	0	-2	1
-6	0	0	0	0	0
3	6	6	0	0	0
4	0	0	4	0	0
1	0	-2	-1	0	-2

FIG. 32(b)

DATA TRANSMISSION ORDER ACCORDING TO THIS SYSTEM
(LOW FREQUENCY COMPONENTS IN ALL SECTIONS ARE TRANSMITTED, THEN HIGH FREQUENCY COMPONENTS ARE SEQUENTIALLY TRANSMITTED)

INFORMATION (FFT COEFFICIENT) IN SECTION NO.=1		INFORMATION (FFT COEFFICIENT) IN SECTION NO.=2		INFORMATION (FFT COEFFICIENT) IN SECTION NO.=V	
REAL PART	IMAGINARY PART	REAL PART	IMAGINARY PART	REAL PART	IMAGINARY PART
45	64	-13	87	53	16
34	-22	8	-32	-89	45
25	-7	5	27	14	-22
0	6	-4	-4	0	19
-2	0	0	3	1	-21
-14	0	-1	0	-4	-6
3	-4	2	-9	0	0
0	0	3	0	-5	-3
0	1	0	6	9	0
0	12	0	8	8	0
-2	-5	4	12	4	6
0	0	0	0	0	-12
-1	0	2	0	3	0
3	1	-4	3	5	-3
-2	-7	0	-2	0	0
0	0	0	-1	1	4
0	1	0	7	-3	0
0	0	3	0	-2	1
-6	0	0	0	0	0
3	6	6	0	0	0
4	0	0	4	0	0
1	0	-2	-1	0	-2

FIG. 33

EXAMPLE OF APPARATUS CONFIGURATION

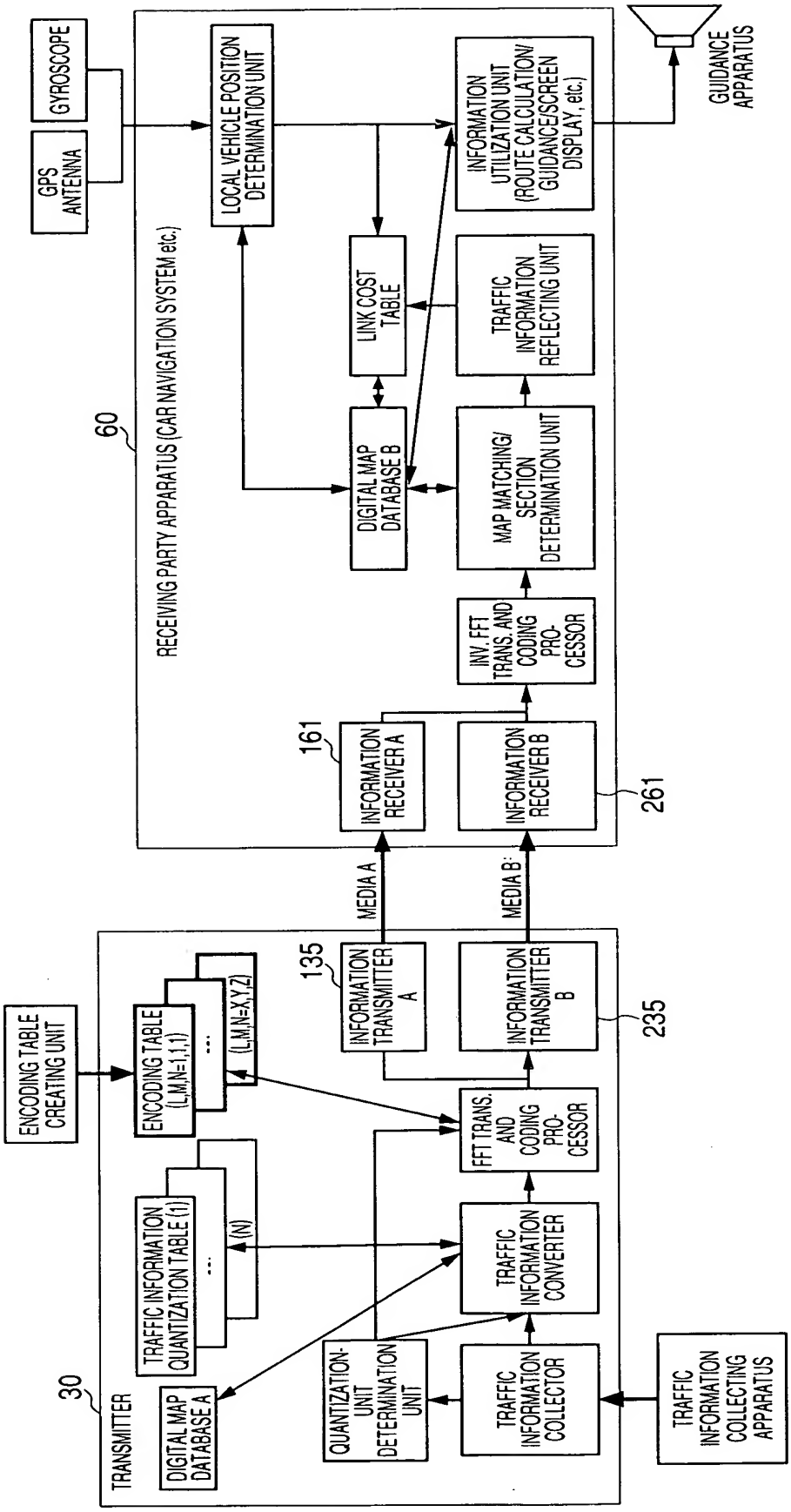


FIG. 34(a)

ORIGINAL INFORMATION

HEADER INFORMATION	
NO. OF THIS INFORMATION	AMOUNT OF TRAFFIC INFORMATION SPLITTING
NO. OF TRAFFIC-INFORMATION-PROVIDED SECTIONS	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
REFERENCE SHAPE DATA STRING NUMBER=N	
DIRECTION IDENTIFICATION FLAG (FORWARD/BACKWARD)	
BEGINNING REFERENCE NODE Pa	END REFERENCE NODE Pb
DISTANCE DIRECTION QUANTIZED SECTION LENGTH IDENTIFICATION CODE	
TRAFFIC INFORMATION QUANTIZATION TABLE IDENTIFICATION CODE	
CURRENT INFORMATION: ENCODING TABLE IDENTIFICATION CODE	
PREDICTION INFORMATION: ENCODING TABLE IDENTIFICATION CODE	
NO. OF QUANTIZED UNIT SECTIONS	
NO. OF TIME ZONES OF PREDICTION INFORMATION	
EFFECTIVE TIME OF CURRENT INFORMATION (HH:MM)	
TRAFFIC INFORMATION AT THE BEGINNING (INITIAL VALUE)	
CURRENT TRAFFIC INFORMATION ENCODED USING THE STATISTICAL PREDICTION DIFFERENCE VALUE FROM AN ADJACENT POINT	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=2	
S	

FIG. 34(b)

DIFFERENCE INFORMATION FROM PRECEDING TIME ZONE

HEADER INFORMATION	
NO. OF THIS INFORMATION	AMOUNT OF TRAFFIC INFORMATION SPLITTING
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER 1	
ENCODING TABLE IDENTIFICATION CODE	
EFFECTIVE TIME OF PREDICTION INFORMATION Q (HH:MM)	
CURRENT TRAFFIC INFORMATION ENCODED USING THE DIFFERENCE FROM PRECEDING TIME ZONE AND STATISTICAL PREDICTION DIFFERENCE VALUE FROM AN ADJACENT POINT	
TRAFFIC-INFORMATION-PROVIDED SECTION SERIAL NUMBER=2	
S	

FIG. 35

EXAMPLE OF APPARATUS CONFIGURATION
(APPLICATION TO PC OR OPERATION SYSTEM)

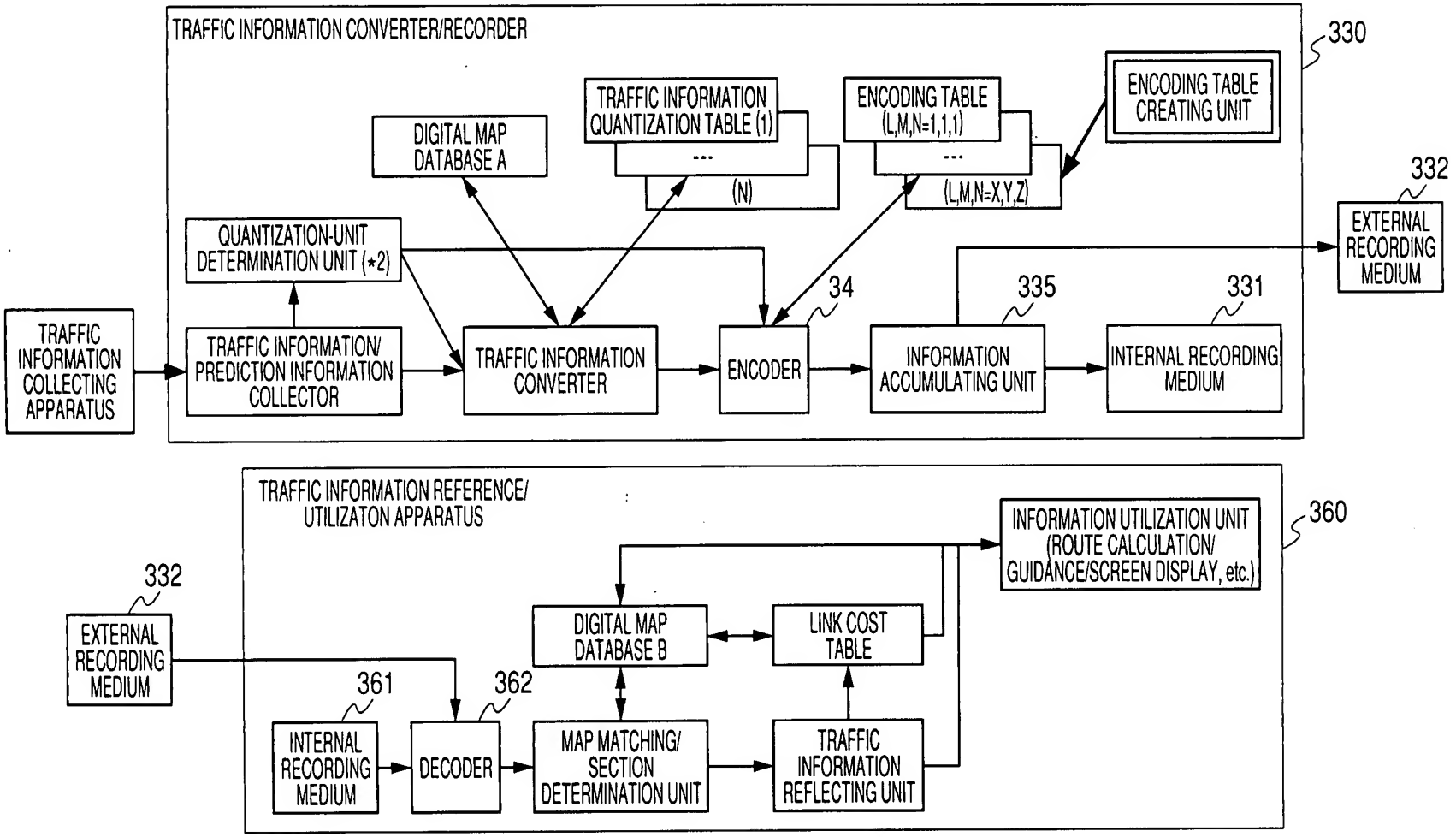


FIG. 36

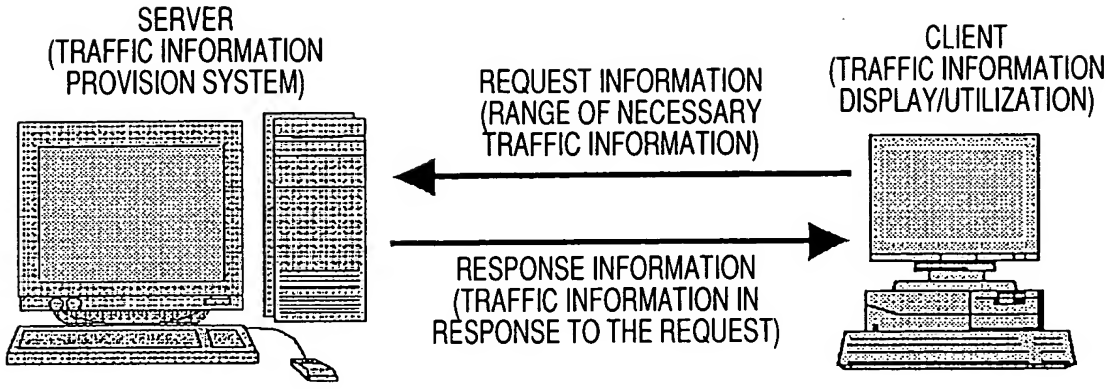


FIG. 37

INFORMATION TRANSMITTED FROM CLIENT
TO SERVER <REQUEST INFORMATION>

HEADER INFORMATION (USER ID, ETC.)
DESIRED MAXIMUM DATA SIZE ※1
LATITUDE/LONGITUDE OF LOWER LEFT/UPPER RIGHT OF RECTANGLE ※2
CENTER POINT ※2
PREFECTURAL/COMMUNAL CODE ※2
ROAD SPECIFICATION (ROAD ATTRIBUTE, ETC.) ※2
LATITUDE/LONGITUDE OF BEGINNING/END FOR PATH SEARCH REQUEST ※3
LATITUDE/LONGITUDE OF CURRENT POSITION + TRAVEL DIRECTION ※3

FIG. 38

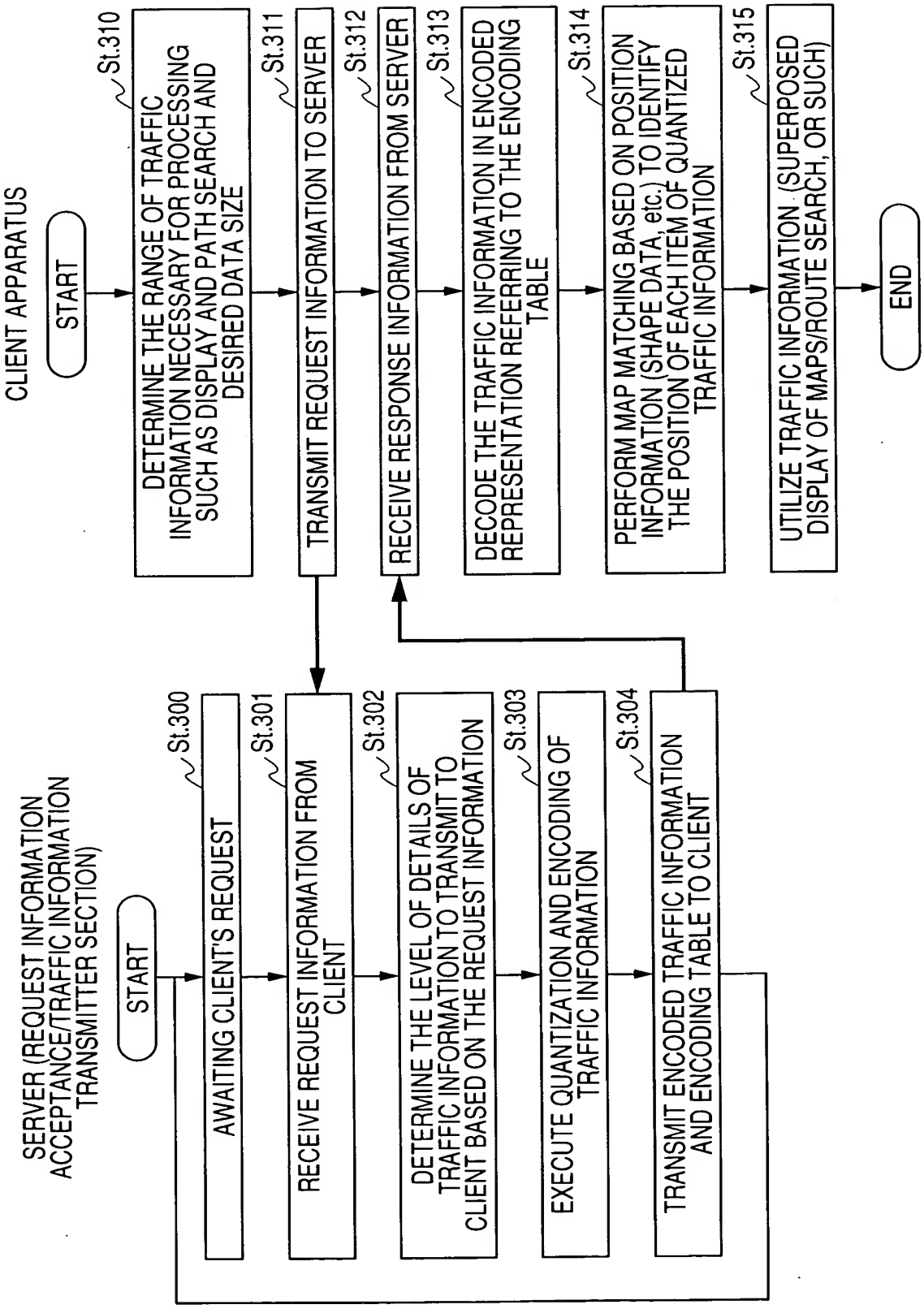

SERVER (REQUEST INFORMATION ACCEPTANCE/TRAFFIC INFORMATION TRANSMITTER SECTION)
START
St.300
AWAITING CLIENT'S REQUEST
St.301
RECEIVE REQUEST INFORMATION FROM CLIENT
St.302
DETERMINE THE LEVEL OF DETAILS OF TRAFFIC INFORMATION TO TRANSMIT TO CLIENT BASED ON THE REQUEST INFORMATION
St.303
EXECUTE QUANTIZATION AND ENCODING OF TRAFFIC INFORMATION
St.304
TRANSMIT ENCODED TRAFFIC INFORMATION AND ENCODING TABLE TO CLIENT
CLIENT APPARATUS
START
St.310
DETERMINE THE RANGE OF TRAFFIC INFORMATION NECESSARY FOR PROCESSING SUCH AS DISPLAY AND PATH SEARCH AND DESIRED DATA SIZE
St.311
TRANSMIT REQUEST INFORMATION TO SERVER
St.312
RECEIVE RESPONSE INFORMATION FROM SERVER
St.313
DECODE THE TRAFFIC INFORMATION IN ENCODED REPRESENTATION REFERRING TO THE ENCODING TABLE
St.314
PERFORM MAP MATCHING BASED ON POSITION INFORMATION (SHAPE DATA, etc.) TO IDENTIFY THE POSITION OF EACH ITEM OF QUANTIZED TRAFFIC INFORMATION
St.315
UTILIZE TRAFFIC INFORMATION (SUPERPOSED DISPLAY OF MAPS/ROUTE SEARCH, OR SUCH)
END

FIG. 39

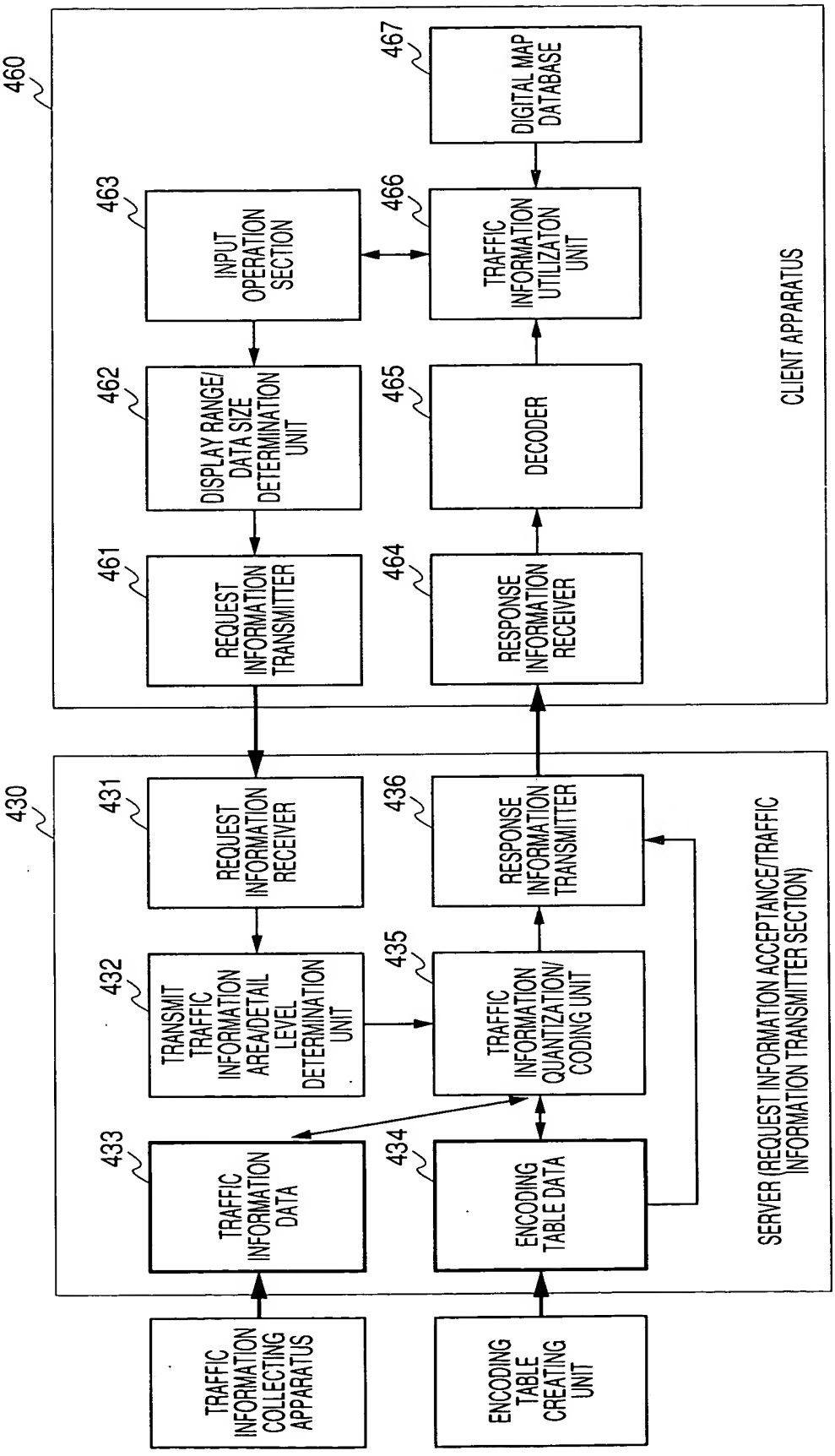

460
CLIENT APPARATUS
461
REQUEST INFORMATION TRANSMITTER
462
DISPLAY RANGE/ DATA SIZE DETERMINATION UNIT
463
INPUT OPERATION SECTION
464
RESPONSE INFORMATION RECEIVER
465
DECODER
466
TRAFFIC INFORMATION UTILIZATON UNIT
467
DIGITAL MAP DATABASE
430
SERVER (REQUEST INFORMATION ACCEPTANCE/TRAFFIC INFORMATION TRANSMITTER SECTION)
431
REQUEST INFORMATION RECEIVER
432
TRANSMIT TRAFFIC INFORMATION AREA/DETAIL LEVEL DETERMINATION UNIT
433
TRAFFIC INFORMATION DATA
434
ENCODING TABLE DATA
435
TRAFFIC INFORMATION QUANTIZATION/ CODING UNIT
436
RESPONSE INFORMATION TRANSMITTER
TRAFFIC INFORMATION COLLECTING APPARATUS
ENCODING TABLE CREATING UNIT

FIG. 40

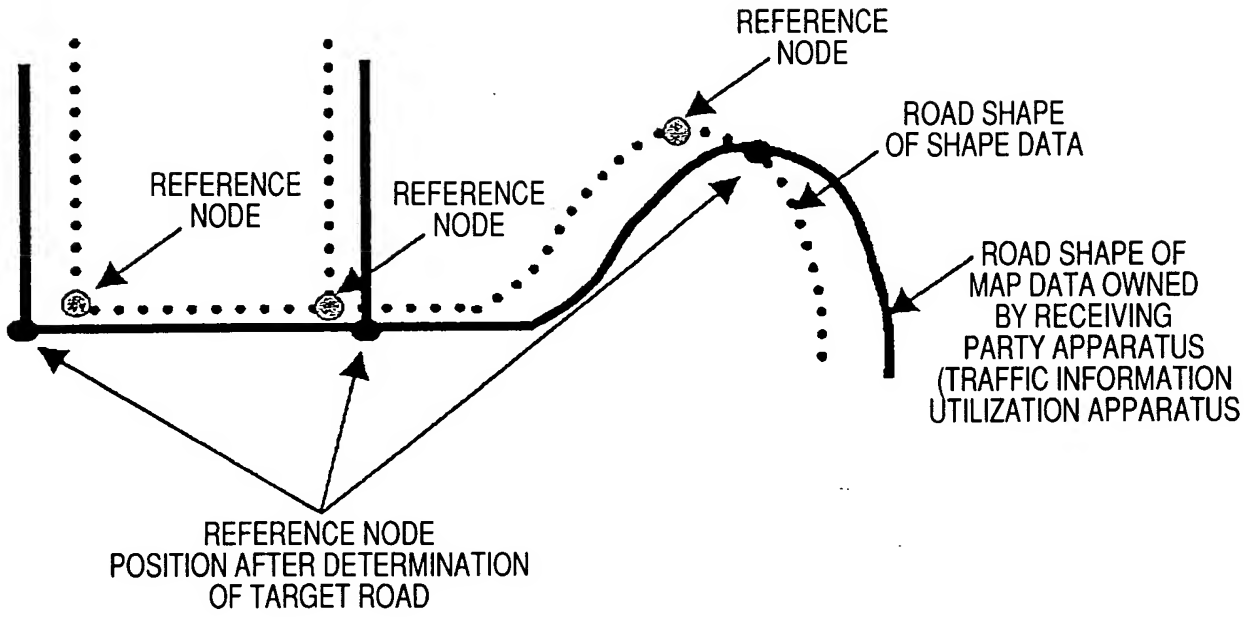

REFERENCE NODE
ROAD SHAPE OF SHAPE DATA
REFERENCE NODE
REFERENCE NODE
ROAD SHAPE OF MAP DATA OWNED BY RECEIVING PARTY APPARATUS (TRAFFIC INFORMATION UTILIZATION APPARATUS
REFERENCE NODE POSITION AFTER DETERMINATION OF TARGET ROAD

FIG. 41

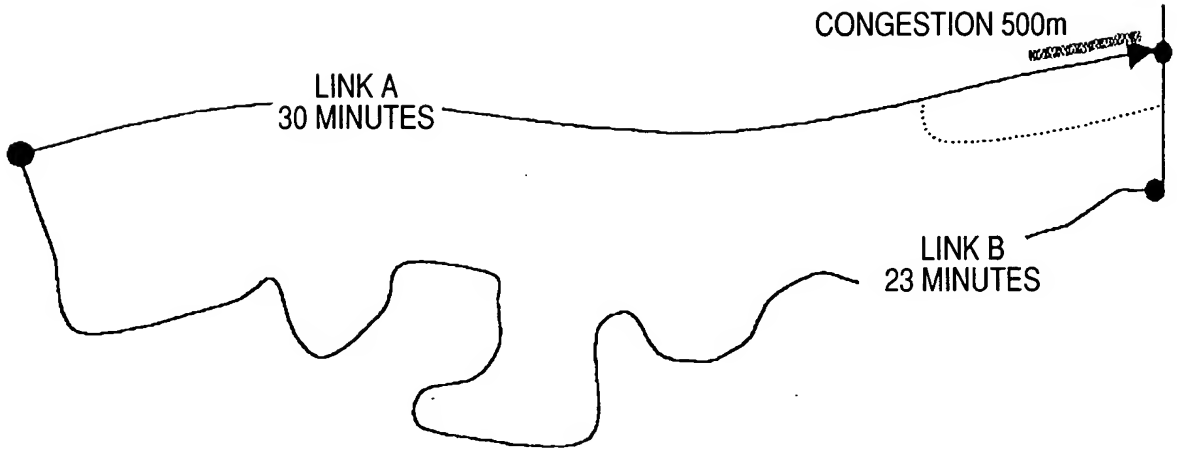


FIG. 42

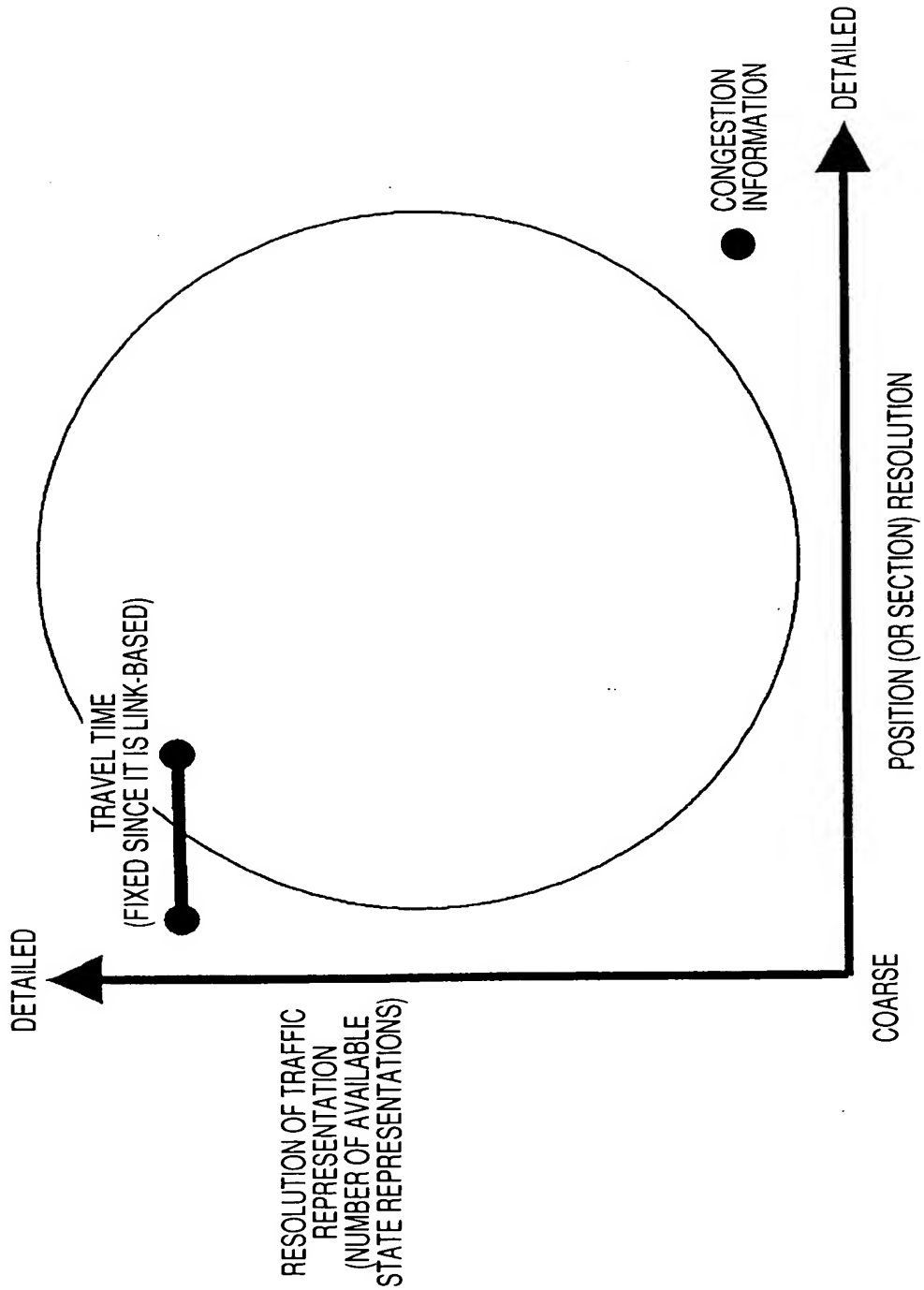

TRAVEL TIME
(FIXED SINCE IT IS LINK-BASED)
CONGESTION
INFORMATION
DETAILED
DETAILED
COARSE
RESOLUTION OF TRAFFIC
REPRESENTATION
(NUMBER OF AVAILABLE
STATE REPRESENTATIONS)
POSITION (OR SECTION) RESOLUTION

FIG. 43(a)

CURRENT LINK SYSTEM

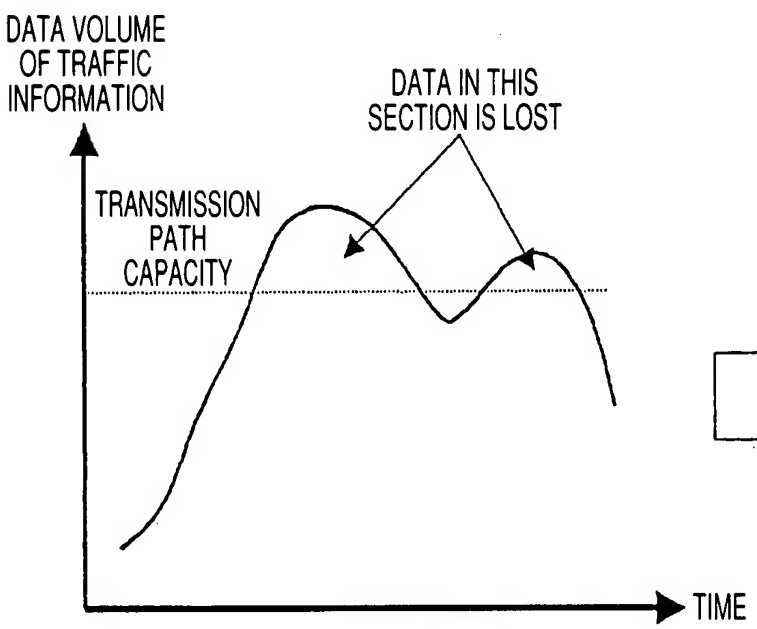


FIG. 43(b)

IDEAL SYSTEM

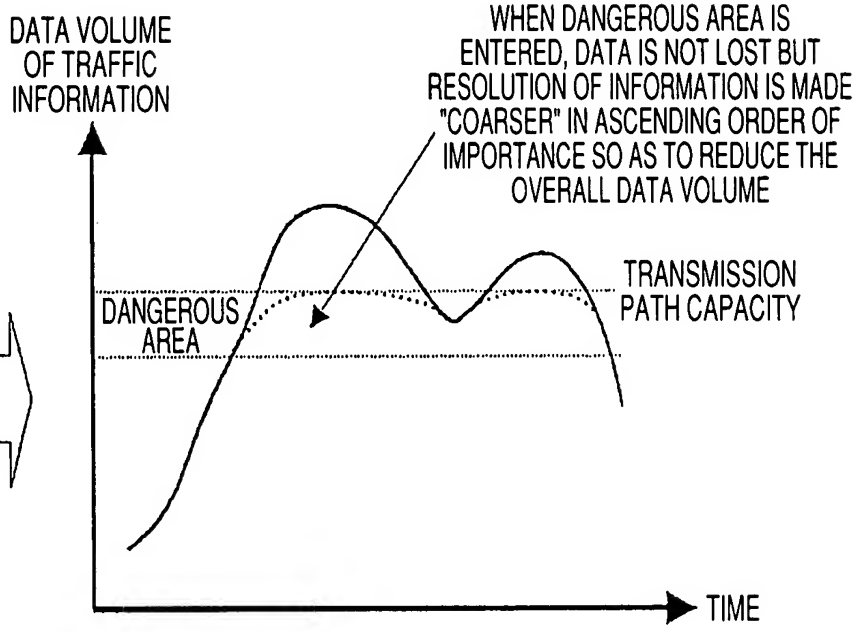


FIG. 44(a)

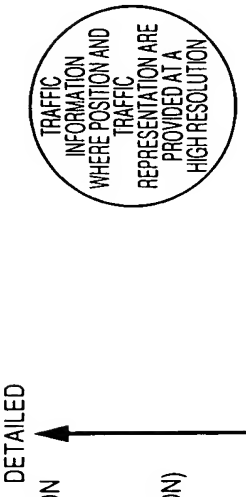


FIG. 44(b)

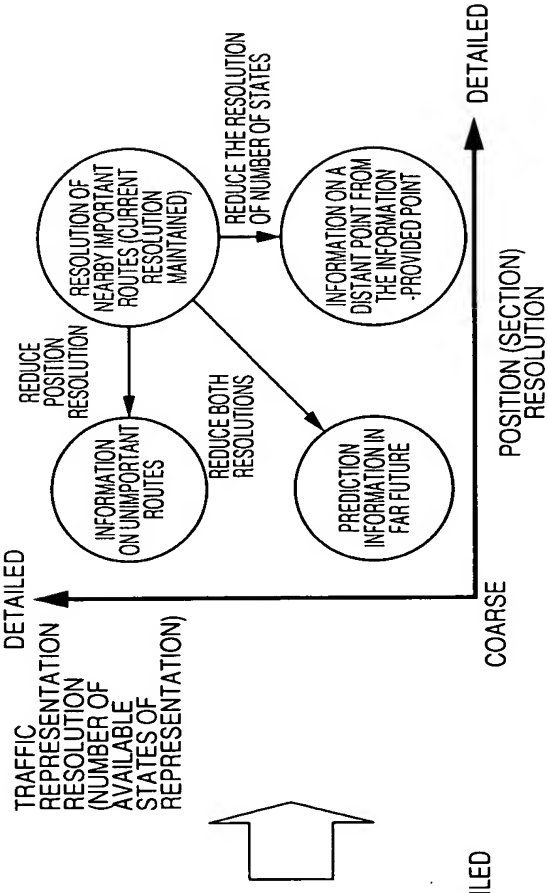


FIG. 45(a)

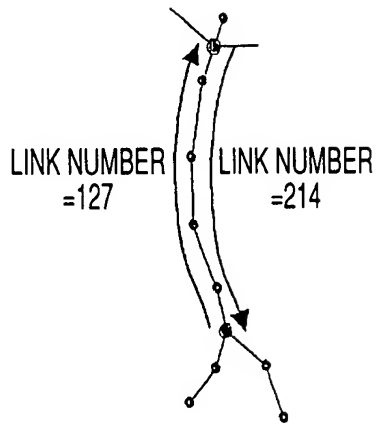


FIG. 45(b)

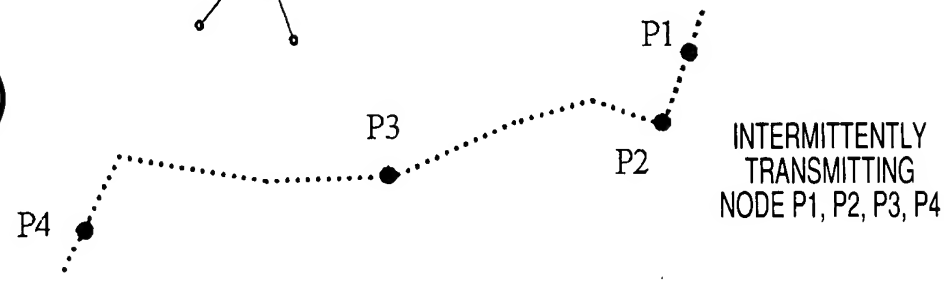


FIG. 45(c)

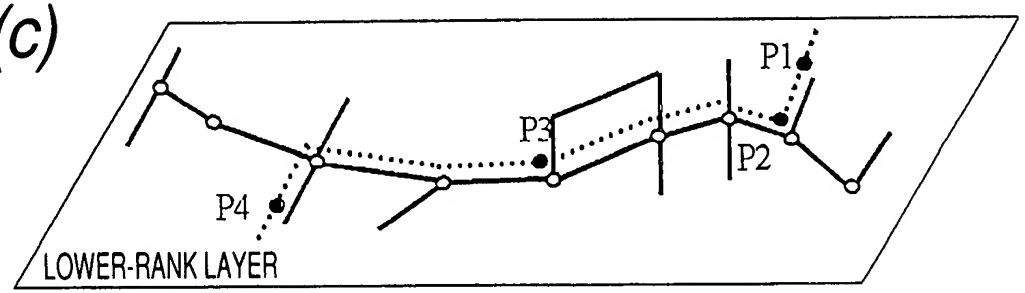
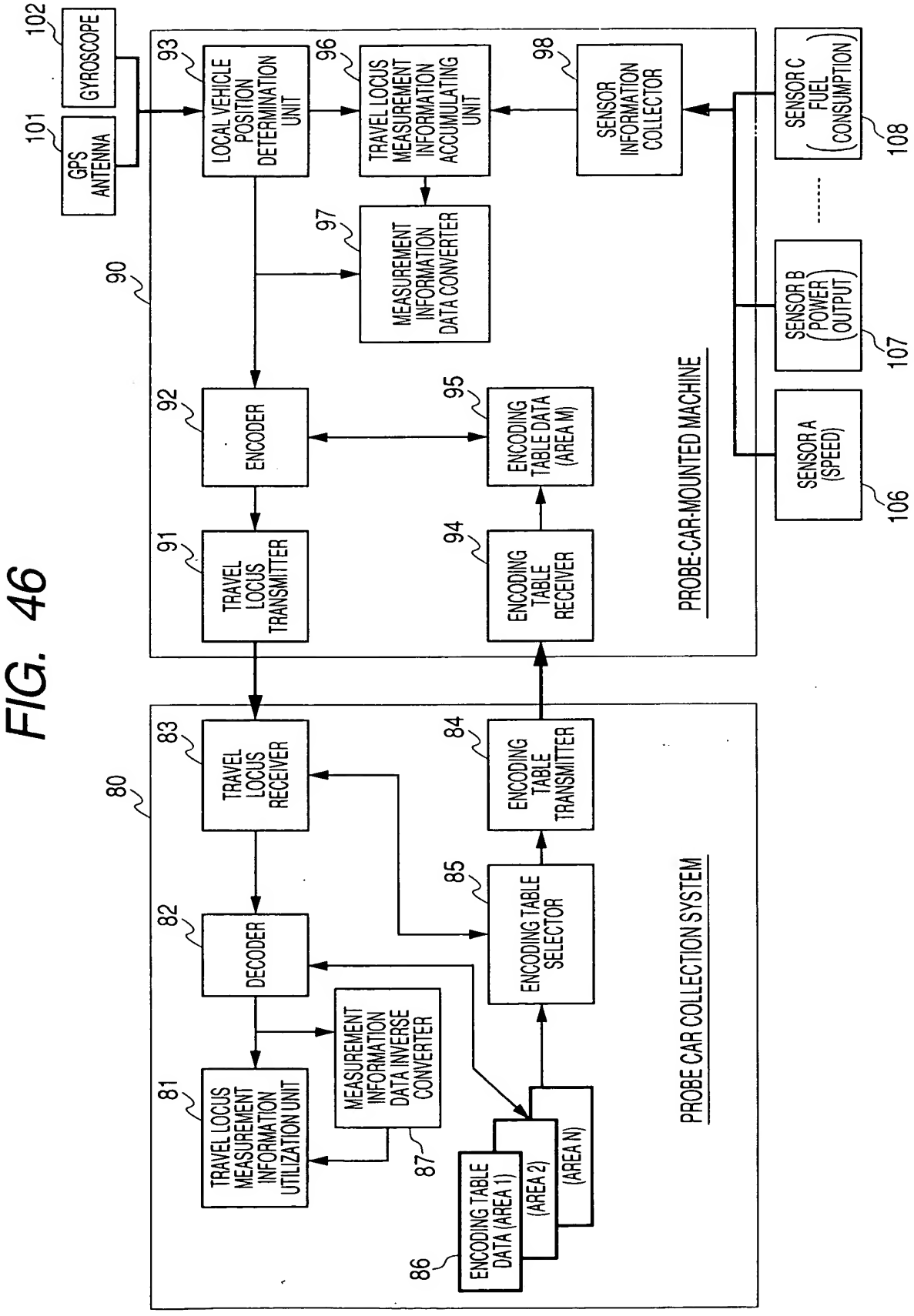


FIG. 46


102
GYROSCOPE
101
GPS ANTENNA
93
LOCAL VEHICLE POSITION DETERMINATION UNIT
96
TRAVEL LOCUS MEASUREMENT INFORMATION ACCUMULATING UNIT
98
SENSOR INFORMATION COLLECTOR
SENSOR C FUEL (CONSUMPTION)
108
97
MEASUREMENT INFORMATION DATA CONVERTER
90
SENSOR B (POWER OUTPUT)
107
92
ENCODER
95
ENCODING TABLE DATA (AREA M)
SENSOR A (SPEED)
106
91
TRAVEL LOCUS TRANSMITTER
94
ENCODING TABLE RECEIVER
PROBE-CAR-MOUNTED MACHINE
80
83
TRAVEL LOCUS RECEIVER
84
ENCODING TABLE TRANSMITTER
82
DECODER
85
ENCODING TABLE SELECTOR
81
TRAVEL LOCUS MEASUREMENT INFORMATION UTILIZATION UNIT
MEASUREMENT INFORMATION DATA INVERSE CONVERTER
87
86
ENCODING TABLE DATA (AREA 1)
(AREA 2)
(AREA N)
PROBE CAR COLLECTION SYSTEM

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